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VOL. 26. Ser. A. Part 5. pp. 249–304. MAY, 1938.

THE REVIEW OF APPLIED ENTOMOLOGY.

SERIES A: AGRICULTURAL.

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[GOLOVIZNIN (D. D.).] **Головизнин (Д. Д.). Boll Worms of the Family Gelechiidae.** [*In Russian.*]—*Sotz. Nauka Tekh.* **5** no. 1 pp. 87–98, 3 figs., 2 refs. Tashkent, January 1937. (With a Summary in English.) [Recd. February 1938.]

Platyedra (*Gelechia*) *malvella*, Hb., and *P. vilella*, Zell., are both abundant on wild malvaceous plants in Uzbekistan, but have not been the subject of study there, though *P. malvella* was found in raw cotton in 1935 and on cotton in fields in one locality in 1936. Characters distinguishing the larvae of these two moths from each other and from those of *P.* (*Pectinophora*) *gossypiella*, Saund., are described, and an account is given of the bionomics of *P. vilella* based on observations carried out in 1933 in northern Persia, where it caused serious damage to cotton in 1932.

The adults appeared in March and there were five generations during the year, the life-cycle being completed in 26–40 days. Cotton and wild Malvaceae were both attacked, but first-generation larvae were confined to the latter. In September and October, some of the larvae entered hibernation in the soil near their food-plants. Apparently, however, hibernation may also occur in the adult or pupal stage. On cotton, the larvae fed chiefly on the fruit-bearing organs, but sometimes attacked the young stems. In the insectary, eggs were laid on the bolls, usually singly, but sometimes up to 8 eggs were observed on bolls in the field, probably deposited by several females. The numbers of eggs laid by a female varied from 18 to 272, but was usually about 120, deposited at the average rate of 12 in 24 hours. The oviposition period, which began on the second day after emergence, averaged 10 days, with a maximum of 18. The young larvae gnaw their way into the bolls, in which they feed on the seeds ; bolls attacked by the older larvae become infested with fungi. Up to 8 young larvae may be present in a boll, but the older ones tend to occur singly. A larva usually infests one boll only, but if this is attacked by fungi it passes to another and may thus damage several. The average duration of the larval stage is 14 days. When full-fed, the larvae abandon the bolls and usually pupate in the soil at a depth of about 6 ins. Occasionally, however, pupation occurs on the soil surface under different kinds of shelter, or in the stems or bolls and on the leaves of the cotton plants. The adults hide during the day, chiefly in cracks in the soil, and become active only at night.

[KAYUMOV (S.).] **Каюмов (С.). Tests of new Vegetable Poisons from Plants that produce Essential Oils.** [*In Russian.*]—*Sotz. Nauka Tekh.* **5** no. 6 pp. 40–47, 3 figs. Tashkent, June 1937. (With a Summary in English.) [Recd. February 1938.]

Laboratory experiments with essential oils against pests of cotton in Uzbekistan [*R.A.E.*, A **24** 748] were continued in 1936, when emulsions of oils of *Dracocephalum moldavica*, *Pelargonium roseum*, *Salvia sclarea*, *Coriandrum sativum*, *Cymbopogon citratus*, *Lippia citriodora* and *Lavandula vera* (*officinalis*) were applied in sprays against *Tetranychus telarius*, L. (*althaeae*, v. Hanst.) on potted cotton plants and *Aphis gossypii*, Glov., on cut leaves of pumpkin standing in jars of water. All the oils at concentrations above 2 per cent. scorched the plants. When applied in 2 per cent. emulsions, the oils of *Dracocephalum*, *Cymbopogon* and *Lippia* killed over 90 per cent. of the mites in 24 hours, and the other oils killed 51–80 per cent., whereas all of them killed over 90 per cent. of the Aphids. Oils of *Cymbopogon* and *Pelargonium* in 3 per cent. emulsions scorched over 93 per cent. of the foliage and caused the plants to die ; they could, therefore, be applied only to weeds. Even at a concentration of 1 per cent., oils of *Lippia* and *Lavandula* killed over 67 per cent. of the mites, and oil of *Lippia* killed 92·7 per cent. of the Aphids. In experiments in which *P. roseum, Lavandula officinalis, Satureia hortensis, D. moldavica, S. sclarea,* four species of *Ocimum* and *Trachyspermum copticum* were artificially infested, *T. telarius* survived and developed normally only on *P. roseum* and *A. gossypii* fed readily only on *S. sclarea.*

The attractiveness to the larvae of *Heliothis armigera,* Hb. (*Chloridea obsoleta,* F.) of leaves of the same series of plants, with the exception of *D. moldavica* and *T. copticum,* was studied in the laboratory in comparison with leaves of tomato. One species of *Ocimum* was preferred to tomato, but the latter was more than twice as attractive as any of the other plants. *Lavandula* was the least attractive. Leaves of *Ocimum basilicum* proved of some value as a repellent against Dermestids infesting insect specimens in boxes, their action lasting for about a month.

Abraham (R.) & Abraham (G.). **Wanzen an Obstbäumen. Mitteilung V. Auftreten und Bekämpfung von** *Plesiocoris rugicollis* **Fall. (Hemipt.-Heteropt.) an der Niederelbe.** [Bugs on Fruit Trees. Fifth Communication. The Occurrence and Control of *P. rugicollis* in the Lower Elbe Districts.]—*Z. PflKrankh.* **48** pt. 1 pp. 18–27, 2 graphs, 5 refs. Stuttgart, 1938.

Records of the occurrence of *Plesiocoris rugicollis,* Fall., in Germany are cited from the literature. It was found injuring apple in the orchards on the Lower Elbe in 1933 [*R.A.E.*, A **22** 340], and the authors observed it there in 1934 and 1935. Records are given of the dates on which nymphs of various instars were found ; they normally begin to hatch in mid-April and become adult towards the end of May. In 1934 adults were observed from 23rd May until 12th June, but in 1935 all the nymphs were apparently destroyed by cold wet weather in the first half of May, and no examples of the Capsid were seen later in that year or in the spring of 1936. The feeding of the nymphs and adults on the young apples causes small spots that are red at first and then turn brown. The fruits, which are only about ¼ in. in diameter, usually drop if there are many punctures. Different varieties of apple were found to differ in susceptibility to attack. Experiments with tar distillates, including Baumspritzmittel [**24** 797], against the eggs gave poor results, but a very satisfactory control of the nymphs and adults was given by crude nicotine, added at a concentration of 0·12 per cent. to a spray of lead arsenate and lime-sulphur applied on 29th May.

Blunck (H.). **Ueber die Möglichkeiten zur Verhinderung der Eiablage des Maikäfers auf landwirtschaftlich genutzten Flächen.** [On the Possibilities of preventing Oviposition by May Beetles on Land used for Crops.]—*Z. PflKrankh.* **48** pt. 1 pp. 27–39, 3 pp. refs. Stuttgart, 1938.

The author has recently concluded that hand collection is the only promising measure for the direct control of adults of *Melolontha* spp.

in Germany [*R.A.E.*, A **25** 488]. In this paper he reviews the literature on methods of preventing oviposition in land for crops by cultural practices and the use of repellents and by attracting the females to special breeding places.

The following are his conclusions : *Melolontha melolontha*, L., and probably also *M. hippocastani*, F., oviposit by preference in sunny, loose, easily warmed ground that is not decidedly moist and has open vegetation. Ground that is well worked and kept in black fallow during the flight period is avoided. Few eggs are laid in ground covered with luxuriant, continuous grass or under a dense and sprouting winter crop, at least in regions with a moist climate. The adults can be repelled temporarily by strewing lime dust, and oviposition can be prevented with certainty by two or three applications of naphthalene to the total amount of about 270–540 lb. per acre. Scarcely any practical use has been made of the possibilities of rendering ground distasteful for oviposition by cultural and chemical measures, and prospects for their further development seem promising.

SCHEIBE (A.). **Das Fritfliegenproblem beim Hafer auf wachstumsphysiologischer Grundlage.** [The Frit Fly Problem in Oats from the Basis of the Physiology of Growth.]—*Angew. Bot.* **19** pp. 260–290, 3 figs. 1937. (Abstr. in *Z. PflKrankh.* **48** pt. 1 pp. 45–46. Stuttgart, 1938.)

Observations have shown that young oats in dry soil are much more resistant to *Oscinella frit*, L., than those in damp soil, the resistance being apparently due to more vigorous growth. Differences in the resistance of varieties is much less evident in moist than in dry soil. The author concludes that a resistant variety is one that has the capacity of forming saccharose, which, perhaps in conjunction with other internal factors, may, in some environmental conditions, determine the speed of growth of the seedling and consequently its relative resistance to the fly.

WELSCH (J.). **Die Massenverbreitung der Pflaumenschildlaus** (*Eulecanium corni* [**Bouché**] **March.**) **und ihre Ursachen.** [The Mass Spread of the Plum Scale, *Lecanium corni*.]—*Landw. Jb.* **84** pp. 431–492, 1937. (Abstr. in *Z. PflKrankh.* **48** pt. 1 pp. 47–48. Stuttgart, 1938.)

Observations near Naumburg and Jena showed that *Lecanium* (*Eulecanium*) *corni*, Bch., occurs chiefly on weakened trees. Its principal food-plants include damson, sloe [*Prunus spinosa*], *Robinia*, ash, elm, and dogwood [*Cornus*]. The susceptibility to attack of the various plants varies according to the soil conditions, but the reaction and lime content of the soil and the microclimate are not concerned. The plants are infested if in a certain physiological state owing to excessive wetness or dryness of the soil, or an inadequate layer of humus.

KRÜGER (F.). **Elektrische Bekämpfung der Maikäferplage.** [Electrical Control of *Melolontha*.]—*Mitt. naturw. Ver. Greifswald* **63–64** pp. 136–143, 5 figs., 5 refs. Greifswald, 1936.

A description is given of an apparatus designed to electrocute adults of *Melolontha* spp. and consisting essentially of a screen, about 3 ft. square, of wires charged with an electric current of 3,000 volts, behind which is a 2,000-watt lamp. Although tests were carried out late in the season, about 50 beetles an hour were attracted to the screen and fell to the ground, either dead or stunned. Modified forms of the apparatus, in which screens entirely surrounded the lamp, were ineffective against mosquitos.

ZACHER (F.). **Neue Untersuchungen über die Einwirkung oberflächenaktiver Pulver auf Insekten.** [New Investigations on the Action on Insects of Dusts active superficially.]—*Verh. dtsch. zool. Ges.* 1937 pp. 264–271. Leipzig, 1937.

In this address Dr. Zacher describes his investigations on the action of powders that desiccate insects and thus kill species that by nature contain little water [*R.A.E.*, A **18** 664 ; **23** 431, etc.]. The shape of the individual dust particles is unimportant, but their size is very material. For instance, silica is much less effective if the finest particles, 2–10μ in diameter, are removed by sieveing. Bulky insects and larvae densely coated with hairs are resistant, whereas species having a relatively considerable body-surface succumb.

HILGENDORFF (G.). **Ueber die Schwebefähigkeit und Wasserlöslichkeit von Calciumarsenaten des Handels.** [On the Suspension Power and Water Solubility of commercial Calcium Arsenates.]—*NachrBl. dtsch. PflSchDienst* **18** no. 1 pp. 1–2. Berlin, January 1938.

Most of the calcium arsenates used in sprays against the potato beetle [*Leptinotarsa decemlineata*, Say] in Germany in 1937 proved deficient in the quality of remaining in suspension. The variation in this quality in 11 commercial brands is shown in a series of curves. For work in orchards and vineyards the suspension of calcium arsenate is assisted by mixing Bordeaux mixture with the sprays [*cf. R.A.E.*, A **25** 764], but for economic reasons no copper sulphate is used in the potato beetle sprays and the calcium arsenate needs adequate suspension power of its own. Improvements in calcium arsenates must also be directed to restricting their water-solubility, as a large amount of soluble arsenic causes scorching. A method for determining the percentages of soluble arsenic pentoxide in them is described.

FRANCKE-GROSMANN (H.). **Zur Kenntnis der Läuseschäden an Weisstanne** (*Abies pectinata*). [A Contribution to the Knowledge of the Injury done by Aphids to Silver Fir.]—*Tharandt. forstl. Jb.* **88** pt. 12 pp. 1050–1082, 13 figs. Berlin, 1937.

Aphids, especially *Chermes* (*Dreyfusia*) spp., are important among the parasites connected with the death of silver firs (*Abies pectinata*) in Germany. The feeding punctures enable the species to be determined, and these injuries are discussed in detail.

The following is taken from the summary: *Cinara* (*Lachnus*) *pichtae*, Mordv., and *Mindarus abietinus*, Koch, puncture the sieve-tubes. Their excreta contain much sugar, indicating such wasteful feeding that injury is possible. The affected tissues are little harmed directly, and visible injury is caused only by *M. abietinus* and only if it is numerous.

The punctures of *Chermes* (*Dreyfusia*) spp. are exclusively or at least predominantly intercellular, the tissues attacked being those normally providing an active exchange of substances from cell to cell. The excreta contain little sugar, but the punctured tissues are more deformed and injured than they are by *Cinara* and *Mindarus*. Infestation by *Chermes* (*Dreyfusia*) *nordmannianae*, Eckstein, which at present is important in causing the failure of young growth, may produce either a benign or malignant injury. The difference in reaction of firs to the punctures of *C. nordmannianae* may depend on heredity or situation. In the Black Forest and Riesengebirge, there is a hereditary condition, but situation can also play an important rôle. Silver fir is always heavily infested and injured by *C. nordmannianae* where growth is particularly luxuriant, owing to the situation being too open and warm, and where the trees are affected by drought in the critical months of June and July.

SCHWERDTFEGER (F.). **Laboratoriumsuntersuchungen über die Lebensdauer der Maikäfer.** [Laboratory Investigations on the Longevity of May Beetles.]—*Anz. Schädlingsk.* **14** pt. 1 pp. 1–5, 4 graphs, 5 refs. Berlin, January 1938.

After emerging in August or September, adults of *Melolontha* remain underground until about the end of April, when they begin an active existence above ground, feeding and reproducing, though they may return underground if the weather becomes cold and unfavourable. The laboratory investigations reported here were made in Prussia in 1936 with adults of *M. melolontha*, L., and *M. hippocastani*, F., collected as they appeared at the surface of the ground in spring. The technique used is described. Paired males and females of *M. hippocastani* and unpaired ones of *M. melolontha* were kept at temperatures averaging 12, 16, 24 and 28°C. [53·6, 60·8, 75·2 and 82·4°F.].

The results are summarised as follows: Longevity depends on the air temperature. Within the range used, high temperatures shorten life and low ones prolong it. Under equal conditions, *M. melolontha* lives longer than *M. hippocastani*. The females of both species live longer than the males. Unfed beetles have a shorter life than fed ones, but even so they attain a considerable age. For instance, at 12°C., males and females of *M. melolontha* averaged 50·3 and 52·3 days with food and 40·8 and 53 days without. At 28°C., the corresponding figures were 6·8, 10·5, 6·5 and 8. Pairing increased the longevity of fed beetles and decreased that of unfed ones. For instance, paired fed females of *M. hippocastani* averaged 44 days at 12°C. and 7 at 28°C., whereas paired unfed females averaged 33 and 5·2 days.

FRANSEN (J. J.). **Ein einfacher Apparat zur Bestimmung des Giftwertes von pulverförmigen Kontakt-Insektiziden.** [A simple Apparatus for ascertaining the toxic Value of Contact Dust Insecticides.]—*Anz. Schädlingsk.* **14** pt. 1 pp. 5–7, 1 fig., 7 refs. Berlin, January 1938.

The author discusses various existing methods for ascertaining the toxic value of contact dust insecticides and describes an apparatus that has given satisfactory results. No glass is used, as condensation causes dusts to adhere and glass wiped dry becomes electrified and attracts dust particles. Even the friction of a current of air suffices to electrify the surface. Other desirable features are that the dust is distributed merely by gravity and air resistance, without resort to bellows, that it does not coat the apparatus, which after a test is immediately available for use with a different dust, and that it touches the test insects in a normal manner and does not overload them during or after application.

The apparatus is a wooden box about 40 inches high and of square section with 11 inch sides. On the open top of the box is closely fitted a double wooden frame, the top section of which turns back from the lower one on a hinge on one side. The top and bottom of the frame are of muslin or, preferably, very fine copper gauze. For making a test, this frame is placed on the box, and an exact quantity of dust is strewn carefully on the upper screen, through which it is then pressed by means of a flat brush, so that it falls very uniformly on the lower screen. About a quarter of a minute after the dust has fallen, the upper half of the frame is turned back on its hinge, and the dust is brushed through the lower screen into the box below. It sinks to the bottom without adhering to the sides, especially if the base of the box is a little larger than the top. In the lower part of one of the sides there is a flap through which the test objects are introduced and removed. If possible, the insects should be in a natural environment, such as on leaves or twigs stood in a jar or on a stand. After a minute, the dust cloud has passed over them and has settled on the bottom of the box. The insects should be confined in wire cages if it is desired that they should not touch dust on leaves, etc., and such cages are needed with flying insects. It is advisable to remove the insects before they drop on to the dust at the bottom of the box. About 44 lb. per acre is the usual quantity applied in practice, and this rate is obtained by using 0·3 gm. dust for each test. About 24 tests can be made in an hour with this apparatus. With insects very highly sensitive to poison it may be necessary to test very small quantities of dust, and to ensure a more uniform distribution a third screen, stretched on top of a wooden frame with sides 2 ins. high, is placed over the apparatus, and the dust is passed through it to the upper screen.

Husz (B.). **Contributions to the Control of the Codling Moth, Scab and Mildew of the Apple Tree.**—*Mitt. kgl. ung. Gartenbaulehranst* **3** 1937. (Abstr. in *Anz. Schädlingsk.* **14** pt. 1 pp. 10–11. Berlin, January 1938.)

Cydia pomonella, L., has two generations a year and a partial third in the plains of Hungary, where it is a serious pest of apple in hot summers. Calcium arsenate is used for sprays, as lead arsenate is prohibited, but in experiments by the author, consistently good results were obtained when lead arsenate was used in sprays applied before 1st June. From mid-June onwards the tests were made solely with calcium arsenate. At the beginning of the tests, some trees were sprayed with a combination of lead arsenate paste and mineral oil emulsion, and they proved to be in better condition than the others, though the oil caused some scorching. A preparation containing a high percentage of nicotine was also combined with mineral oil and seems a possible substitute for lead arsenate. Fallen fruit from sprayed and unsprayed trees had infestations of 4·7 and 30·4 per cent., respectively. In an orchard in which both arsenicals were used, the infestation was 39 per cent .for trees sprayed with calcium arsenate throughout the season, and 20 per cent. for those sprayed with lead arsenate up to 3rd June and with calcium arsenate subsequently.

MISCHLING (—). **Der Star als guter Helfer bei der Rüsselkäferbekämpfung.** [The Starling as a valid Auxiliary against Weevils.]—*Bl. Naturk. u. Natursch.* **24** pt. 6 p. 91, 1937. (Abstr. in *Anz. Schädlingsk.* **14** pt. 1 p. 12. Berlin, January 1938.)

Beet in a field in the Leonding region was severely infested by *Tanymecus palliatus*, F., in 1935. Before control measures were attempted, starlings visited the field for four consecutive days and completely cleared away the weevils.

SVOBODA (J.) & PETERKA (—). [**Ferric Hydrate as a Treatment for Arsenic Poisoning in Bees.**]—*Vcela mor.* Brno, March 1937. (Reported in *Bee World* **19** no. 2 p. 21. Royston, Herts., February 1938.)

Investigation of severe mortality of bees in the Teschen district of Czechoslovakia, where iron works are situated, showed that no infectious disease was present, but arsenic, as well as sulphur, iron and aluminium compounds, was found in the bodies of the bees. Typical symptoms of the disease are described; they were also obtained by feeding bees on syrup containing arsenic trioxide. When the bees of the affected colonies were fed on syrup containing a 0·5 per cent. solution of ferric hydrate at the rate of 10 cc. per litre, the mortality ceased and the colonies developed well.

It is suggested by the editor (p. 13) that the same treatment might protect bees from the poisoning that results from dusting with insecticides containing arsenic.

KAMIŃSKI (E.). **Über die Halticinen-Fauna (Coleoptera) und ihre Nahrungspflanzen aus der Umgebung von Wilno.** [The Halticid Fauna and its Food-plants in the Environs of Vilno.] [*In Polish.*]—*Trav. Soc. Sci. Lett. Wilno* **10** (1935) pp. 207–242, 1 pl., 20 refs. Vilno, 1936. (With a Summary in German.) [Recd. 1938.]

A list is given, based on observations in 1930–34, of 56 species of Halticids belonging to 15 genera that occurred on wild and cultivated plants, including those in a botanical garden, near Vilno. The food-plants, ecology and date of first appearance are given for each species, and the food-plants are also tabulated separately, with the names of the flea-beetles attacking them. The commonest and economically most important species were: *Phyllotreta undulata*, Kutsch., *P. nemorum*, L., *P. atra*, F., and *P. cruciferae*, Goeze, on crucifers; *Aphthona euphorbiae*, Schr., and *Longitarsus parvulus*, Payk., on flax; *Chaetocnema* (*Tlanoma*) *concinna*, Marsh., on beet and *Fagopyrum tataricum*; *Haltica oleracea*, L., on *Godetia* and, in one instance, on strawberry; and *L. lycopi*, Foudr., and *L. waterhousei*, Kutsch., on mint. Brief notes are given on the life-history of, and damage caused by, some of the species.

MINKIEWICZ (S.). **Masowy pojaw** *Cheimatobia brumata* **Stph. w lasach nadl. Puławy w r. 1935–36.** [The Outbreak of *Operophtera brumata* in the Forestry Division of Pulawy in 1935–36.]—*Roczn. Nauk rol.* **41** pp. 433–435. Poznań, 1937. (With a Summary in German.)

Outbreaks of *Operophtera* (*Cheimatobia*) *brumata*, L., occurred on oaks and other trees in the district of Pulawy (central Poland) in 1935 and 1936, the larvae completely defoliating the oaks in May and early June. Larvae of *Erannis* (*Hybernia*) *defoliaria*, Cl., and the predacious Carabid, *Calosoma inquisitor*, L., was also observed on the infested oaks. Adhesive bands were applied on the older oaks in November, and considerable numbers of adult moths of both sexes were caught on them.

KAMIŃSKI (E.). **Szarek buraczany** (*Bothynoderes punctiventris* **Germ.**) **na Wołyniu.** [The Beet Weevil (*Cleonus punctiventris*) in Volhynia.] [*In Polish.*]—*Roczn. Ochr. Rośl.* **4** no. 4 pp. 12–29, 2 maps, 19 refs. Pulawy, 1937.

Of recent years, *Cleonus* (*Bothynoderes*) *punctiventris*, Germ., has become one of the most important pests of sugar-beet in the Province of Volhynia (eastern Poland). In the spring of 1937, it constituted about 77 per cent. of the weevils found on beet, other species in descending order of abundance being *C. piger*, Scop., *C. foveicollis*, Gebl., and *C.* (*Chromoderus*) *fasciatus*, Mull. *Cleonus tigrinus*, Panz., occurred in very small numbers, but is probably not injurious to beet. All stages of *C. punctiventris* are described and an account of its bionomics is given, based largely on the literature [*R.A.E.*, A **25** 52, etc.]. In Volhynia, the overwintered adults come to the surface of the soil when its temperature reaches a mean of 9·8°C. [49·64°F.], maximum emergence taking place at the end of April or beginning of May. A very few instances of adult flight have been observed. Oviposition lasts from about 10th May till about mid-June. The egg, larval, prepupal and pupal stages average 11, 49, 5 and 16 days, respectively. Pupation takes place in September and early October. Examination of the soil in sugar-beet fields in the second half of October 1937 showed that young adults, pupae and larvae represented 92·8, 2·4 and 4·8 per cent. of the population, respectively, while 24·4 per cent. of the larvae and 5·2 per cent. of the pupae and adults together were attacked by diseases. The weevils chiefly occurred in high ground and in soil that was not very damp.

In the spring of 1937, more than half the beet fields in Volhynia were surrounded with trap ditches to catch the migrating adults, and this resulted in a marked reduction of the infestation.

Latvijas Augu aizsardzibas institūta darbibas pārskats par 1936–1937 gadu. [Report of the Latvian Institute for Plant Protection for 1936–37.]—[*Rep. Latv. Chamb. Agric. 1936–37*] pp. 67–83. Riga, 1937. (With Summary in English.)

In an account of research on *Apion seniculum* Kirby (pp. 69–70), E. Ozols states that it caused serious damage to alsike clover [*Trifolium hybridum*], especially in the southern part of Latvia, the loss in yield of seeds sometimes amounting to 80 per cent. The development of the weevil was completed in 86·2 days at 14·4°C. [57·92°F.], 34·8 days at 19·7°C. [67·46°F.] and 20 days at 30·2°C. [86·36°F.]. The same author also describes observations on the effect of different chemical fertilisers on the infestation of cultivated crucifers by *Phaedon cochleariae*, F. (pp. 70–71). It was found that plants growing in soil treated with large quantities of nitrogen suffered most, whereas in the case of other fertilisers no influence on the degree of injury was observed.

[Lozina-Lozinskiĭ (L. K.).] **Лозина-Лозинский (Л. К.). Frost-Resistance and Anabiosis in the Caterpillar of** *Pyrausta nubilalis* **Hübn.** [*In Russian.*]—*Zool. Zh.* **16** no. 4 pp. 614–642, 6 graphs, 43 refs. Moscow, 1937. (With a Summary in English.)

An account is given of laboratory investigations in Leningrad on anabiosis and resistance to cold in larvae of *Pyrausta nubilalis*, Hb.; some of the information has already been noticed [*R.A.E.*, A **23** 564, 673]. The author understands by anabiosis a state of an organism in which the basic physiological processes, such as reaction to irritation, muscular contraction, respiration and circulation of the body fluids, cease or are so retarded that they cannot be observed. Anabiosis in insect larvae does not include diapause, as in the latter state they are able to move and react to irritation, and, though respiration is lowered, a certain amount of oxygen is consumed. In both cases, however, the state of rest is primarily caused by a considerable decrease of the water content in the body, or by an increase of the osmotically or colloidally bound water. Therefore, the high degree of cold resistance and anabiosis exhibited by larvae of *Loxostege sticticalis*, L., and *P. nubilalis* during the process of freezing occur only during the diapause and may serve as a criterion for the latter.

[Shapiro (D. S.).] **Шапiро (Д. С.). Materials for a Study of the Ecology of the Mite,** *Epitetranychus* **sp., on Soy-bean Plants.** [*In Ukrainian.*]—*Proc. zool.-biol. Inst. sci. Res.* **1** pp. 172–174. Kharkov, 1936. [Recd. 1938.]

Soy beans are severely infested near Kharkov by a species of *Tetranychus* (*Epitetranychus*) that attacks both sides of the leaves, causing them to drop. It is most abundant in July and August, when up to 750 individuals were counted on 50 leaves in 1931. It was also found on *Convolvulus arvensis*, *Arthemis vulgaris*, *Agropyrum repens*, *Taraxacum*, cabbage, beans (*Phaseolus*) and cucurbits, the first of these being the most infested. It apparently migrated to soy beans from these in the early spring. Observations in August 1931 of various fields of soy beans showed that those surrounded by high grass had 100 per cent. of plants infested, while those bordered by roads had 38–40 per cent.

[Shapiro (D. S.).] **Шапiро (Д. С.).** *Ceuthorrhynchus syrites* **Germ.—an Insect injuring** *Camelina sativa*. [*In Ukrainian.*]—*Proc. zool.-biol. Inst. sci. Res.* **1** pp. 175–184, 6 figs., 10 refs. Kharkov, 1936. (With a Summary in English.)

Considerable damage is caused to *Camelina sativa* in the Ukraine by larvae of *Ceuthorrhynchus syrites*, Germ. Investigations at Kharkov in 1929–30 showed that winter is passed in the adult stage on *Camelina* and wild crucifers or in the soil near such plants. In spring, the weevils fed on the leaves of *Camelina*, and later on the flower-buds and ovules. Females oviposited from May to July in the young seed-vessels. The larvae hatched in 5–6 days and fed on the seeds. A larva generally eats about half of the 9 seeds in the siliqua, and, when full-fed, either eats its way out or falls out when the prematurely ripened siliqua opens, and pupates in the soil. Many larvae were parasitised in both years by two unidentified Hymenoptera. *Camelina* was also attacked by larvae of *Dasyneura brassicae*, Winn., which develop in the siliquae.

Experiments on delayed sowing showed that late crops were much less attacked by the weevil than early ones, but this was offset by the decreased yield of late sowings.

Worsley (R. R. Le G). **Rotenone. Part I. The Determination of Rotenone.**—*J. Soc. chem. Ind.* **55** no. 51 pp. 349T–357T, 1 fig., 4 refs. London, December 1936. [Recd. 1938.]

A detailed account is given of an improved method for the determination of rotenone, following percolation of the raw material with hot ethyl acetate [*R.A.E.*, A **26** 36]. The following is the author's summary: Ethyl acetate is a new and very efficient solvent for rotenone in derris and *Mundulea* samples. With ethyl acetate the Soxhlet extraction is replaced by a hot percolation taking only $\frac{3}{4}$–$2\frac{1}{2}$ hours, according to the quantity of material required to be extracted. A weighed amount of pure rotenone is added to all extracted resins [*cf.* **25** 110] so as to bring the content up to at least 40 per cent.; 1 gm. is added even if already up to or above 40 per cent. Rotenone is separated as its carbon tetrachloride complex and some precautions are discussed. The purity of the complex is accurately determined by stirring with alcohol, and apart from occasional samples is always between 91 and 96 per cent., with a mean value of about 94 per cent. The purity of the rotenone after the alcohol recovery treatment is on the average 99·2 per cent., with a range from 89·9 to 99·6 per cent. except in a few exceptional cases. Purity of the complex can be determined by optical rotation and gives on the average results 2·6 per cent. high. For routine estimations it is sufficiently accurate in most cases to take the complex as being 94 per cent. pure. The addition of 5 per cent. by weight of decolorising charcoal to derris, or 10 per cent. to *Mundulea* samples, gives better coloured and purer extracts.

Worsley (R. R. Le G.). **The Evaluation of *Derris* and *Mundulea*.**—*J. Soc. chem. Ind.* **56** pp. 175T–176T, 1 fig., 1 ref. London, May 1937. [Recd. 1938.]

The following is based on the author's summary: The method of evaluating samples of derris and *Mundulea* advocated in a previous paper [*R.A.E.*, A **26** 37] by taking the percentage of optical constituents (there called optical dehydrocompounds) in the ether extract has been shown not to hold in general; instead the following method is recommended. Samples of derris and *Mundulea* can be separately evaluated by determining the amounts of optical constituents in each. Two groups of curves are obtained when these values are plotted against toxicity, a *Mundulea* being about 2·8 times as toxic as a derris with equal contents of optical constituents. The "toxicity ratio" [*loc. cit.*] is now defined as the reciprocal of the percentage of optical constituents (" optical dehydrocompounds ") in the sample and is directly proportional to the weight of derris or *Mundulea* to be taken to give equal toxicity. To compare derris and *Mundulea* with each other the factor 2·8 may be used ; about 2·8 times the weight of a derris is required to give the same toxicity as a *Mundulea* of the same toxicity ratio. This, however, is only approximate. Some tentative suggestions are advanced to explain the greater toxicity of *Mundulea*.

BALACHOWSKY (A.) & VIENNOT-BOURGIN (G.). **Note préliminaire sur la valeur pratique des traitements tardifs dans la lutte contre le carpocapse ou " ver des pommes "** (*Laspeyresia pomonella* **L.**).—*C. R. Acad. Agric. Fr.* **24** no. 1 pp. 35–45, 6 refs. Paris, 1938.

In 1937, experiments were carried out in apple and pear orchards distributed from east to west across central France on the control of *Cydia* (*Laspeyresia*) *pomonella*, L., by means of summer sprays [*cf. R.A.E.*, A **24** 679], the calyx spray being omitted. In this part of France infestation does not begin until the first week of June and continues until September. Sprays of lead arsenate with 1 per cent. summer oil emulsion were applied about 1st and 20th June and 1st August, and one of lead arsenate alone on 12th July. Diplumbic lead arsenates, containing 14–18 per cent. As_2O_5, were used at the rate of 6½–10 lb. per 100 gals. according to the arsenic content ; the oil was highly refined with an unsulphonatable residue of 98 per cent. and an average viscosity of 90–95 seconds Saybolt, the concentrated emulsion containing about 90 per cent. pure oil. The percentages of fruit infested varied with the variety from 0 to 3·5 on sprayed trees, from 18 to 60 on controls and, in one orchard, from 20 to 25 on apple trees sprayed with lead arsenate on 12th April and 29th May only.

The arsenical residues on two lots of fruit picked on 2nd November were 0·596 and 1·721 mg. per kg., respectively. French regulations prescribe that two months should elapse between the final spraying and harvest. The schedule set out will, therefore, probably be satisfactory for use in commercial apple orchards throughout central and northern France, but cannot at present be recommended for pears that are harvested in August and September.

Pests of the Apple Tree.—*Cyprus agric. J.* **32** pt. 4 pp. 101–108, 6 figs. Nicosia, December 1937.

The chief pest of apple in Cyprus is *Cydia pomonella*, L., adults of which begin to appear in mid-April and are abundant during May. The life-cycle of the first generation lasts 50–75 days, but some of the larvae overwinter. There are probably only two generations in the year, which overlap [*R.A.E.*, A **26** 108], but possibly a third generation occurs in the warmer areas. Measures recommended for control include the use of sprays and trap-bands and orchard sanitation.

Hyponomeuta padellus, L., attacks apple and plum and may completely defoliate the trees in some localities. Larvae begin to feed on the leaves soon after they open. Cocoons are formed in a web of silk on the twigs, and the moths emerge in May and June. Eggs are laid in June in groups on the twigs, and the larvae hatch in a few days but remain beneath the flattened egg shells until the following spring. The early sprays of lead arsenate applied against *C. pomonella* are effective against *H. padellus* if the webbing is not extensive. Control is also given by the application during the winter of a 9 per cent. petroleum emulsion, and the same spray destroys *Parlatoria oleae*, Colv., which frequently occurs on apple. The Tingid, *Stephanitis pyri*, F., attacks the undersides of the leaves of apples and pears, causing them to drop early. A spray of nicotine sulphate is effective against it, particularly if white oil emulsion is added. For the control of *Eriosoma lanigerum*, Hsm., which is widely distributed in most areas where apples are grown, but does not appear to cause much damage, nicotine sulphate (1 : 800) may be combined with the sprays against *C. pomonella*, a spreader being added if not included in the original spray. A spray of nicotine sulphate, soft soap and water (1 : 5 : 800) is recommended against leaf Aphids. Other pests of apple in Cyprus are the borer, *Zeuzera pyrina*, L., which may be destroyed by means of a wire, or by placing a few crystals of paradichlorobenzene in the tunnel, *Anthonomus pomorum*, L., and *Ceratitis capitata*, Wied.

SILVESTRI (F.). **L'entomologia agraria nello sviluppo delle nostre Colonie.** [Agricultural Entomology in the Development of our Colonies.]—*Atti XXV Riun. Soc. ital. Prog. Sci. Tripoli 1–7 Novembre 1936* repr. 22 pp., 2 pp. refs. Rome, 1937. [Recd. January 1938.]

This survey of the chief entomological problems in the Italian colonies is arranged according to plants, the plants being those of which the cultivation is expected to increase. The greater part of the paper refers to Italian East Africa, but the data apply equally to Libya.

MARTELLI (G. M.). **Le infestioni entomatiche in Tripolitania.** [Insect Infestations in Tripolitania.]—*Atti III Congr. Studi colon., Firenze 12–17 Aprile 1937* pp. 133–140. Florence, 1937.

The more common Aphids in Tripolitania, are *Aphis rumicis*, L., which is very injurious in some years to beans and lucerne ; *Anuraphis schwartzi*, Börner (*persicae*, Boy.) and *Hyalopterus arundinis*, F. (*pruni*, F.), which are common on almond ; the woolly apple aphis, *Eriosoma lanigerum*, Hsm., which is confined to a few oases ; and a species attacking *Citrus*, probably *Toxoptera aurantii*, Boy. (*aurantiae*, Koch), which is occasionally abundant, but is limited to some extent by natural enemies. There are many Coccids, but the commonest are *Chrysomphalus dictyospermi*, Morg., *Aspidiotus hederae*, Vall., and *Icerya purchasi*, Mask., which tend to spread with the increase of cultivation, although all are more or less controlled by natural enemies. *I. purchasi* disappears as an agricultural pest whenever *Rodolia* (*Novius*) *cardinalis*, Muls., is introduced. The Capsid, *Cyrtopeltis* (*Engytatus*) *tenuis*, Reut., occurs almost everywhere on tomato and probably transmits a virus disease, but is seldom very injurious. The Psyllid, *Euphyllura olivina*, Costa, is also widely distributed and often does much harm to olives along the coast. The Tingid, *Monosteira unicostata*, Muls. & Rey., is fairly common, especially on pear, but the losses are not serious. *Schistocerca gregaria*, Forsk., is occasionally abundant, but *Dociostaurus maroccanus*, Thnb., and *Calliptamus italicus*, L., have caused little damage of recent years.

Ceratitis capitata, Wied., is perhaps the most harmful insect in certain districts to all fruits, including a highly pungent indigenous variety of *Capsicum*. The mild winter permits the occurrence of numerous generations and late infestation of oranges. *Dacus oleae*, Gmel., is common on olives on the coast, but is not so injurious as it is in Italy. The species of *Eulophus* parasitising it [**25** 536] is *E. longulus*, Zett. *Phloeothrips oleae*, Costa, is widespread on olives, causing deformation of the leaves and also attacking the flowers and fruits. *Laphygma* (*Caradrina*) *exigua*, Hb., and other Noctuids often skeletonise whole crops of lucerne.

DESHPANDE (V. G.). **Important Pests of Sugarcane in the Bombay Presidency.**—*Curr. Sci.* **6** no. 1 pp. 33–35, 6 refs. Bangalore, July 1937.

Notes are given, largely from the literature, on the life-history and control of the principal pests of sugar-cane in the Bombay Presidency. They are, in order of importance, the stem-borers, *Chilo zonellus*, Swinh., *Argyria sticticraspis*, Hmps., and *Procometis trochala*, Meyr., *Hieroglyphus banian* var. *elongata*, Uvarov, *Phyllognathus dionysius*, F., *Trionymus sacchari*, Ckll., *Aleurolobus barodensis*, Mask., *Pyrilla* sp. [*cf. R.A.E.*, A **26** 8], *Emmalocera depressella*, Swinh., and termites.

LAL (K. B.). **Anti-Jassid Resistance in the Cotton Plant.**—*Curr. Sci.* **6** no. 3 pp. 88–89, 6 refs. Bangalore, September 1937.

In view of the fact that the chief factor in the resistance of cotton plants to attack by Jassids is the hairiness of the leaves [*cf. R.A.E.*, A **16** 350 ; **22** 679], experiments were made on the correlation of hair density and resistance to attack by *Empoasca devastans*, Dist., at Lyallpur in 1936. Examination of comparable leaves from seven varieties of cotton showed that resistant varieties had short hairs and high hair density ; the most hairy American variety, which also had the greatest average hair length, was not the most resistant.

Some evidence exists that resistance to Jassid attack is due to some peculiarity of the leaf-veins that prevents oviposition.

FRANSSEN (C. J. H.). **Over de levenswijze van de** *Albizzia*-**boktor** (*Xystrocera festiva* **Pascoe**) **en zijn bestrijding.** [On the Biology of the Cerambycid, *X. festiva*, Thoms., attacking *Albizzia* and its Control.]—*Bergcultures* **11** no. 49 pp. 1728–1731, 1 fig., 12 refs. [Batavia] 1937. (With a Summary in English.)

The Cerambycid, *Xystrocera festiva*, Thoms., all stages of which are described, is very common in Java, where it attacks and sometimes kills various species of *Albizzia* used as shade trees. It also infests *Pithecolobium lobatum*, and it has been recorded on coffee in Indo-China [*R.A.E.*, A **2** 490]. Two types of *Albizzia falcata* grow in the Buitenzorg district, of which one has white wood and is easily attacked while the other has a reddish wood and is very resistant.

In the laboratory, the eggs were laid in numbers of up to 400 together on pieces of stem and branch. Both egg and pupal stages lasted for an average of 18 days, and total development at Buitenzorg required about 190 days. The boring by the young larva causes exudations of gum and sap, the resultant black stains rendering first infestations easily visible. Pupation takes place in deep burrows, several of which usually occur together, and the stems and branches may be broken by wind at the places thus weakened. Drenching the bark with a solution of paradichlorobenzene in kerosene has been suggested against the larvae [**19** 517], but the author considers this too costly and troublesome, and proposes that, on detection of the first infestation, enough bark should be removed to expose the larvae. Bore-holes should be tightly closed with cement to imprison the beetles. Severely infested trees should be felled.

FISHER (W. S.). **A new Cerambycid Beetle injurious to Orchids in Java.**—*Ent. Meded. Ned.-Ind.* **3** no. 4 pp. 53–54. Buitenzorg, 1st December 1937.

FRANSSEN (C. J. H.) & TIGGELOVEND (L. M. J.). **Some Notes on the Life History of** *Diaxenes phalaenopsidis* **Fish. (Col., Cerambycidae).**—*T.c.* pp. 55–57, 1 fig.

The Lamiid, *Diaxenes phalaenopsidis*, sp. n., the adult of which is described in the first paper, appears to be an important pest of cultivated orchids of various genera in Java and Sumatra. At Buitenzorg, the egg and larval stages lasted 12–13 and 50–60 days, respectively. The eggs are laid under the epidermis of the roots of the orchids, and the larvae bore into them and eventually pupate in their mines. Many larvae may infest one plant, but not more than two were found in a single root. The adults are active at night and feed voraciously on the young leaves of the orchids and also on the flowers and fruits of some species. Adults collected in orchid nurseries remained alive in the laboratory for three months when fed on young orchid leaves.

KALSHOVEN (L. G. E.). **Verdere aanteekeningen over de huismier** *Monomorium destructor* **Jerd.** [Further Notes on the House Ant, *M. destructor*.]—*Ent. Meded. Ned.-Ind.* **3** no. 4 pp. 65–71, 1 fig. Buitenzorg, 1st December 1937. (With a Summary in English.)

The damage to the insulation of electric cables in the Netherlands Indies reported in two papers already noticed [*R.A.E.*, A **25** 508] appears to be due to *Monomorium destructor*, Jerd., and *M. gracillimum* var. *mayri*, For., which latter, and not *Solenopsis geminata rufa*, Jerd., is stated to have been the species found with its mandibles fastened to the rubber [*loc. cit.*]. In Batavia, *M. destructor* has been observed gnawing the rubber insulation of electric wires in shops, and, in two cases, it had made holes through the 0·8 mm. lead sheathing of wiring. *Dolichoderus bituberculatus*, Mayr, has been found in association with damaged wiring, but was not apparently responsible for the injury. A very serious infestation by *M. destructor* of a house in the island of Ternate, Moluccas, occurred in 1932, clothes and fabrics being damaged. A brief review of the apparently scanty literature on its biology is given, partly from this *Review*. In the paper in which it was described, Jerdon (1851) stated that it prefers animal to vegetable food, but feeds greedily on sugar.

TAKAHASHI (R.). **Studies on the Food Habits of the Formosan Coccidae.** [*In Japanese.*]—*Bull. Res. Inst. Formosa* no. 136, 14 pp. Taihoku, December 1937.

About 8 per cent. of the plants in Formosa are attacked by Coccids, and most of the indigenous species are restricted to single genera of plants. Few of them are found on cultivated plants, but many of the imported species are polyphagous and generally attack cultivated rather than wild plants. The Coccids are divided into four main groups according to food habits, and a table shows the percentage of species of wild plants among the food-plants of each imported polyphagous Coccid. In Formosa, *Parlatoria zizyphus*, Lucas, is found only on *Citrus* and not on *Zizyphus*, *Asterolecanium pustulans*, Ckll., feeds only on *Nerium*, though it is polyphagous in other countries, and *Diaspis bromeliae*, Kern., and *Lepidosaphes sacchari*, Hall, are restricted to pineapple and *Miscanthus*, respectively. *Pseudococcus brevipes*, Ckll., migrates to *Cyperus* when its primary food-plant, pineapple, is removed and also feeds on banana and a palm. *Icerya purchasi*, Mask., prefers *Acacia* and *Casuarina*, which are common in Australia, its country of origin.

SHIRAKI (T.) & SONAN (J.). **Insect Pests of Banana.** [*In Japanese.*]—*Trop. Hort.* **7** no. 4 pp. 432–450, 11 figs. Taihoku, December 1937.

Brief descriptions are given of the 19 species of insects that occur on banana in Formosa, with notes on their bionomics and control. They include *Dacus* (*Chaetodacus*) *dorsalis*, Hend., *Sesamia inferens*, Wlk., *Clania pryeri*, Leech, and *Termes* (*Odontotermes*) *formosanus*, Shir., but the only important pest is *Cosmopolites sordidus*, Germ., which, since it was first observed in 1912, has spread over the whole island. It is especially injurious to young plants and has four generations annually, all stages being present throughout the year.

TAKANO (S.). **Relation of Sugar Cane Varieties to Insect Pests.** [*In Japanese.*]—*J. Formosan Sug. Plant. Ass.* **15** no. 7–8 pp. 195–198. Taichu, Formosa, 1937.

In Formosa, varieties of sugar-cane with narrow erect leaves are usually attacked to a greater extent by *Scirpophaga nivella*, F., and *Oregma* (*Ceratovacuna*) *lanigera*, Zehnt., and those with broad bending leaves, which afford sheltered sites for oviposition, by *Eucosma schistaceana*, Sn., and *Diatraea venosata*, Wlk. Varieties with hard stems are less severely infested by *Diatraea* and *Eucosma*, but those with erect stalks are the most liable to injury by subterranean insects.

MISAKA (K.) & KOREISHI (T.). **Notes on the Infestation of Persimmon by** *Chaetodacus dorsalis* **Hendel. (Preliminary Report.)** [*In Japanese.*]—*Shokubutsu-kensa Shiryo* **7** no. 1 p. 1. Taihoku, 1938.

In Formosa, females of *Dacus* (*Chaetodacus*) *dorsalis*, Hend., readily oviposit in fruits of persimmon, but the larvae rarely develop in the fruits, and in breeding experiments no larva pupated [*cf. R.A.E.*, A **24** 275]. This may have been due to the presence of tannin in the fruits.

UCHIDA (H.). **Relation of Effectiveness of the Fumigation by Carbon Bisulphide to the Development of the Egg, Larva and Pupa of** *Chaetodacus dorsalis* **Hendel. (Preliminary Report.)** [*In Japanese.*]—*Shokubutsu-kensa Shiryo* **7** no. 1 pp. 4–5. Taihoku, 1938.

In investigations on the effect of fumigation with carbon bisulphide on the immature stages of *Dacus* (*Chaetodacus*) *dorsalis*, Hend., it was observed that the susceptibility of the eggs increased with their stage of development [*cf. R.A.E.* A **24** 699]. The larvae were most resistant early in the third instar, more so in the second than in the first, and most susceptible when full-fed. Pupae were least resistant at the beginning and end of the pupal period.

YAMAZAKI (T.). **On the Attack and Injury by** *Sesamia inferens* **Walk. (First Report.)** [*In Japanese.*]—*Oyo-Dobuts. Zasshi* **9** no. 5 pp. 213–227. Tokyo, December 1937.

In the Loochoo Islands, *Sesamia inferens*, Wlk., feeds on sugar-cane, maize, wheat and rice. Infestation of different varieties of sugar-cane by this Noctuid varies from 13·3 to 30 per cent., those with hard leaves being the more resistant. Canes planted in spring seem to be the least injured, since they are exposed to infestation for a shorter period than those planted in other seasons.

SAITO (K.). **On** *Malacosoma neustria testacea* **Motsch.** [*In Japanese.*] —*Oyo-Dobuts. Zasshi* **9** no. 5 pp. 228–237. Tokyo, December 1937.

The Lasiocampid, *Malacosoma neustria testacea*, Motsch., occurred in abundance in 1937 in central Korea, and caused serious damage to a great variety of trees. The overwintered eggs hatched in mid-April, and the larvae passed through five instars and pupated in late May. The pupal stage lasted about a fortnight. The adults paired and oviposited within two days of emergence, the eggs being laid in masses of about 270. The older larvae were parasitised by *Pimpla disparis*, Vier., *Theronia atalantae*, Poda, *Tachina larvarum*, L., and a fungus of the genus *Botrytis*, and the young ones by species of *Apanteles*.

YUASA (H.). **Some Notes on a Cecidomyiid of Soy Bean.** [*In Japanese.*]—*Oyo-Dobuts. Zasshi* **9** no. 6 pp. 266–273. Tokyo, December 1937.

The Cecidomyiid injurious to soy beans in northern Japan, which was recently described as *Contarinia soya* [*R.A.E.*, A **25** 477], is referred to the genus *Profeltiella*. Near Tokyo, the average number of larvae in a petiole was 23·75, and the maximum 77.

TAKAGI (G.). **Studies on the artificial Multiplication of the Sumach Gall Aphid. I. Especially** *Schlechtendalia chinensis* **Bell.** [*In Japanese.*]—*Bull. For. Exp. Sta. Chosen* no. 26, 253 pp., 29 pls., 23 figs. Keijo, Korea, 1937.

The galls produced by *Melaphis* (*Schlechtendalia*) *chinensis*, Bell, on its primary (summer) food-plant, *Rhus javanica*, which are of commercial value as a source of tannin, are found in Korea, Japan, Formosa and China. Investigations at Keijo, Korea [*cf. R.A.E.*, A **23** 45, etc.] showed that the winged sexuparae fly from mosses (*Mnium* spp.) to *Rhus* in late April and early May. Their ovaries contain 3–6 young, and one individual can give birth to sexuales of both sexes. The latter pair in late May and early June, and each female gives birth to a single stem-mother. The stem-mothers crawl up to the young leaves and cause the galls, in which apterous females develop. The winged fundatrigeniae migrate to *Mnium* in September and produce young that remain motionless during the winter and become adult sexuparae in April. In experiments, 18–75 per cent. of the stem-mothers artificially deposited on *Rhus* produced galls, and these forms were successfully transported 250 miles for inoculation. The galls obtained artificially contained 43·3–54·8 per cent. of tannin. Pruning is necessary to obtain twigs suitable for gall-making. Descriptions are given of the forms of this Aphid, the development of the gall and methods of cultivating the food-plants ; and another Aphid, *Kaburagia rhusicola*, gen. et sp. n., is described from individuals found in commercial galls obtained from *Rhus* in China.

FUKUSHI (T.). **The Relation of Aphids to the Transmission of Legume Mosaics.** [*In Japanese.*]—*J. Sapporo Soc. Agric. For.* **29** no. 139 pp. 189–216. Sapporo, 1937. (With a Summary in English.)

The history of investigations on the transmission of mosaic diseases of leguminous plants by Aphids is reviewed, and a list is given of the recorded vectors of these diseases throughout the world. A mosaic disease apparently originating from red clover has recently been observed in peas and broad beans at Sapporo. In experiments, the virus was transmitted by *Myzus persicae*, Sulz., from and to red clover, peas, beans and other leguminous plants. The Aphids often become infected by feeding for 5 minutes on diseased plants, and single Aphids sometimes transmitted the disease by feeding on healthy plants for less than 30 minutes. Transmission appeared to be mechanical, as the Aphids remained infective without feeding for about an hour after removal from diseased plants, but not for about five hours. Red clover appeared to be an unfavourable food-plant for the Aphid and, under natural conditions, is probably attacked accidentally during migration.

OTA (Y.). **On *Agrilus spinipennis* Lewis.** [*In Japanese.*]—*Insect World* **42** no. 1 pp. 17–19. Gifu, Japan, January 1938.

In Japan, *Agrilus spinipennis*, Lewis, the adult and larva of which are briefly described, attacks *Zelkova* and elm. Its life-cycle apparently requires 2 years ; the larvae overwinter beneath the bark, and the adults emerge from May to August.

TANABE (C.) & SEKIYA (I.). **On the Control of Hesperiid Larvae injurious to Rice.** [*In Japanese.*]—*J. Plant Prot.* **25** no. 1 pp. 18–27. Tokyo, January 1938.

In August 1937, Hesperiid larvae caused serious damage to rice in Nagano Prefecture, Japan. The females oviposited chiefly on varieties with deep-coloured tender leaves. Among spray insecticides tested against the larvae, lead arsenate in Bordeaux mixture proved very effective.

KATSUMATA (K.). **On the Control of *Epicauta gorhami* with Insecticides.** [*In Japanese.*]—*J. Plant Prot.* **25** no. 1 pp. 33–36. Tokyo, January 1938.

The Meloid, *Epicauta gorhami*, Mars., which attacks various crops in Japan, is fairly resistant to derris insecticides and lead arsenate, but pyrethrum and nicotine, especially the former, are effective against it.

Amano (E.). *Cocytodes caerulea* **Guenée, a Pest of Ramie, and its Control with Insecticides.** [*In Japanese.*]—*J. Plant Prot.* **24** no. 12 pp. 923–927. Tokyo, December 1937.

Ramie [*Boehmeria nivea*] is sometimes severely damaged by *Cocytodes coerulea*, Gn., which has two or three generations a year near Tokyo [*cf. R.A.E.*, A **25** 47]. The larvae first appear in mid-May and are usually most common from August onwards. Sprays of lead arsenate have given effective control.

Dumbleton (L. J.). **Borers in Fruit-trees.**—*N.Z. J. Agric.* **55** no. 5 pp. 295–298. Wellington [N.Z.], November 1937.

Notes are given on the bionomics and control of borers infesting fruit trees in New Zealand, with brief descriptions of the larvae and adults. The Hepialid, *Charagia virescens*, Duble, occurs only on North Island, and the adult moths are found from September to November. It is likely that eggs are laid on the ground, and the young larvae climb the trees to find a suitable site for penetration. The larval stage, which is passed within the tree, probably lasts about 3 years. The entrance hole of the larva is concealed by a silken web; from the shallow excavation beneath the web, galleries extend round the limb in each direction, while a third extends inwards towards the centre of the limb and then vertically downwards for about 6 ins. These tunnels may be up to ½ in. in diameter. *C. virescens* has been recorded from apple, peach, nectarine and lemon; infestation is probably more severe where patches of bush or native vegetation are close to the orchard.

Larvae of the Cerambycid, *Oemona hirta*, F., attack native and introduced trees and have been recorded from lemon, injury to which is common, apple and almond. Adults emerge in the spring, and the females oviposit on dead or exposed wood. The larval stage probably lasts more than a year, and the pupal stage is completed in a few weeks. The larva bores along the branch and also round it beneath the bark, weakening it so that it breaks easily. Larvae of this Cerambycid are difficult to distinguish from those of the genus *Navomorpha*. *N. lineata*, F., commonly damages Douglas fir [*Pseudotsuga taxifolia*]; the adults are in flight from November to January, and the method of entry into the plant and the nature of the tunnels, which are made in living wood, resemble those of *O. hirta*. *N. sulcata*, F., which is found in a number of native and exotic trees and has been recorded from apple and almond [*R.A.E.*, A **11** 118; **20** 379], does not usually bore in living wood or make circular tunnels under the bark. It is likely that much of the damage attributed to it is caused by *N. lineata*, though the latter has not been definitely recorded from fruit trees. *Charagia* possibly attacks perfectly healthy trees; but the Cerambycids only attack healthy through dead wood.

Adults of the Lamiid, *Xylotoles* (*Xyloteles*) *griseus*, F., emerge in December and January. The female makes a hole in the bark of a tree with its mandibles and oviposits between the bark and the wood. The larvae bore between the bark and the wood and later enter the wood, but confine themselves to dead, dry material. Various native and exotic trees are attacked, and larvae are sometimes found in mummied apples. *X. laetus*, White, a closely related species has a similar life-history.

Where these pests are present in an orchard, it is advisable to remove all dead wood and to seal pruning scars and wounds with white lead or grafting wax. Where possible, damaged wood should be cut out of the tree. The borers may be destroyed by probing the burrows with wire. If the tunnels are too twisted for this to be done, insecticides may be injected. The author considers, however, that those commonly used are likely to injure the trees and recommends nicotine or derris, particularly the former.

NEW SOUTH WALES: **Plant Diseases Act, 1924. Proclamation.**—*Govt. Gaz.* no. 148, reprint 1 p. Sydney, 8th October 1937. [Recd. February 1938.]

This proclamation, amending the regulations for the control of fruit-flies in New South Wales [*R.A.E.*, A **25** 165, etc.], provides for the use of an alternative bait-spray consisting of 2 oz. sodium fluosilicate and 2½ lb. sugar dissolved in 4 gals. water. The specifications of the covered pit for the disposal of waste and infested fruit [*cf.* **22** 88] are modified.

SMITH (J. H.). **A White Grub Epizootic in North Queensland.**—*J. Aust. Inst. agric. Sci.* **3** no. 4 pp. 225–226, 1 fig. Sydney, December 1937.

Lepidiota caudata, Blkb., has been a serious pest of pastures on the Atherton tableland of Queensland for several years [*R.A.E.*, A **25** 162], but the numbers of larvae were greatly reduced in May 1937 by a widespread epizootic. The preceding summer had been the driest for some years and the surface soil was parched. As mortality was also severe in 1936 owing to dry soil conditions [*cf. loc. cit.*], the importance of this pest should be reduced for the next few years.

In the affected larvae, necrotic lesions first appeared near the spiracles and ultimately enveloped the whole of the body; sometimes the anal tract was everted shortly before death. Comparable symptoms have been observed in larvae from most parts of Queensland, but an epizootic of this type is unusual. A staphylococcus, two bacilli and a diplococcus were isolated from bacterial flora in the body fluids of deceased larvae and were cultured on peptone agar. On hypodermic inoculation of healthy white grubs with suspensions of these organisms, only the staphylococcus was consistently fatal. Symptoms corresponded to those observed in the field, and death occurred within 48 hours. It may reasonably be supposed that the causal organism of the epizootic was generally distributed through the soil, its increased pathogenicity in an outbreak being due either to its occurrence in a more virulent form or to environmental conditions having predisposed the insect to attack. In the field, infections through larval injury, to which hypodermic inoculation may be compared, are unlikely to lead to an epizootic. The obvious method of infection would seem to be through the alimentary canal by ingestion of soil. In the laboratory, however, attempts to induce rapid infection through the gut failed completely, and larvae sprayed with a suspension of staphylococcus and returned to soil, or kept in soil thoroughly soaked in a virulent suspension, suffered no ill effects within two months. The work was repeated several times on white grubs of different species, with the same results. The experimental data suggest that the necessary predisposing conditions for infection on an epizootic scale were not fulfilled. It is possible that field infection occurs at some vulnerable phase, such as a moult ; if it does take place through the gut, the onset of symptoms and death must be very slow.

Caldwell (N. E. H.). **The Control of the Red-shouldered Leaf Beetle.**—*Qd agric. J.* **48** pt. 6 p. 730. Brisbane, December 1937.

In recent tests, dusts containing derris, pyrethrum [*cf. R.A.E.*, A **25** 601] or a mixture of both were used against the red-shouldered leaf-beetle [*Monolepta rosea*, Blkb.] on *Citrus*. The results with pyrethrum were particularly satisfactory ; the beetles were half-paralysed and dropped from the trees within a few minutes, and apparently only a small proportion recovered sufficiently to fly or to climb the trees. Derris was slower in action and less effective. A dust containing equal parts of pyrethrum and kaolin is therefore recommended for the control of these beetles in Queensland, applied in the early morning when they are sluggish. Weeds beneath the trees should be treated some time after the trees have been dusted, so that all the beetles that have fallen receive a lethal dose of the dust.

Blöte (H. C.). **A new Cotton-stainer (Heteroptera, Pyrrhocoridae).**—*Zool. Meded.* **20** pt. 1–2 pp. 181–182, 1 fig. Leyden, 1937.

Dysdercus mendesi, sp. n., is described from cotton in Campinas, São Paulo.

Edwards (W. H.). **Report on an agricultural Survey in the Cayman Islands with Notes on the Control of the more important Pests and Diseases which were found attacking economic Plants in that Dependency of Jamaica.**—*Bull. Dep. Sci. Agric. Jamaica* (N.S.) no. 13, 41 pp., 6 pls., 2 figs. Jamaica, 1937.

Chapters in this bulletin deal with the history of the Cayman Islands with regard to their insect fauna and plant diseases, with the more important insect pests and diseases found attacking economic plants, and with the preparation and application of insecticides and fungicides. The Caymans consist of 3 small islands, approximately midway between Jamaica and the south-western coast of Cuba. Grand Cayman is about 60 miles from Little Cayman and Cayman Brac, which are only 7 miles apart, and its imported flora and fauna are somewhat different, so that it should be regarded as a separate unit for plant quarantine regulations. For example, in Cayman Brac *Citrus* trees were heavily infested with scale insects, but in Grand Cayman they were remarkably free from pests.

In a recent survey, it was found that coconuts in the three islands were attacked by *Pseudococcus nipae*, Mask., which is of little importance, and by *Aspidiotus destructor*, Sign., which causes much damage. All leaves severely infested by the latter should be severed ; they should be stacked a few yards away from the tree so that the young Coccids will be unable to crawl back, whereas parasites and predators will fly back as soon as the leaves begin to dry. The application of insecticides for the control of this pest is not considered to be economically feasible. It is suggested that if wind-breaks were established, predatory Coccinellids could be introduced ; at present it would be nearly impossible for them to survive on coconut leaves owing to the constant strong winds. The large population of tree lizards may, however, prevent their establishment. It is, therefore, important to increase the vigour and resistance of the trees by cultural methods.

Roots and vines of yams were frequently infested by *Aspidiotus harti*, Ckll. As the underground parts are the more heavily infested, control by spraying would be only partly successful. When the crop is being harvested, tubers from infested plants should be scraped clean in the pot holes in which they grew, and all débris and vines from the infested plants should be burnt in the pot holes. After heavy infestations, yams should not be replanted for at least one season, but should be replaced by some other crop. Damage to sweet potatoes by *Cylas formicarius*, F., var. *elegantulus*, Summ., should be reduced by ploughing previously infested fields, and collecting and destroying all pieces of vines and tubers on them. Sound tubers should be used as baits before replanting ; they should be partly buried about 10 feet apart, and the weevils should be collected from them daily. After about a week, they should be burnt or fed to pigs to destroy any eggs deposited in them. Where the weevil is abundant, sweet potatoes should be grown on level ground rather than on the hill system, as the latter tends to increase infestation. Care should be taken to use clean cuttings for planting ; and wild Convolvulaceae, which may serve as alternative food-plants, should be eradicated in the vicinity of sweet-potato fields. Sugar-canes were infested by *Diatraea saccharalis*, F., but it was scarce, probably because of the extraordinary abundance of lizards. Canes that had not been trashed or cultivated were, however, often heavily infested by *Trionymus* (*Pseudococcus*) *sacchari*, Ckll. No insect pests were observed on bananas.

HASEMAN (L.). **Controlling Insect Pests of Melons, Cucumbers, and related Crops.**—*Bull. Mo. agric. Exp. Sta.* no. 391, 19 pp., 6 figs. Columbia, Mo., November 1937.

An account is given of the life-histories of insect pests of cucurbits in Missouri, the damage caused by them and measures for their control. The chief pests dealt with are *Diabrotica melanocephala*, F. (*vittata*, F.), *D. duodecimpunctata*, F., *Anasa tristis*, DeG., *Aphis gossypii*, Glov., *Melittia satyriniformis*, Hb., *Diaphania nitidalis*, Stoll, and *D. hyalinata*, L.

Division of Entomology.—*Rep. N. Y. St. agric. Exp. Sta.* **56** (1936–37) pp. 40–53. Geneva, N.Y., 1938.

Some of the information in this report of work on insect pests in New York in the year ending June 1937 has already been noticed [*R.A.E.*, A **25** 424, 545, 549, 684, 687]. It was found that *Glossonotus crataegi*, Fitch, on apple [*cf.* **25** 371] could be controlled by dormant sprays of lubricating oil emulsion [*cf.* **22** 401], but was not affected by coal-tar oils. In apples stored at 32 and 36°F., all eggs and larvae of *Rhagoletis pomonella*, Walsh, died in about one month and 45 days, respectively, but a few larvae survived 70 days storage at 40°F. Injections of carbon bisulphide gave promising results in the control of the round-headed apple-tree borer, *Saperda candida*, F. In the four chief peach-growing counties of western New York, an extensive survey was made of the incidence of *Macrocentrus ancylivorus*, Rohw., parasitising larvae of *Cydia* (*Grapholitha*) *molesta*, Busck, in peach twigs. In the two western and two eastern counties, where the Braconid had been present for 6–8 and 4 years, the percentage parasitism of the first brood averaged 23·96 and 4·47, and of the second 52·91 and 7·43, and the percentages of fruit infested by the third brood were 5·38 and 24·40, respectively. Other parasites that have been distributed [*cf.* **25** 372] have not so far proved as efficacious.

Baits or sprays against *Otiorrhynchus* (*Brachyrhinus*) *ovatus*, L., on strawberry should normally be applied about the time of the second picking of mid-season varieties. In tests under nursery conditions, a fairly high mortality was obtained with baits of bran, sawdust or both, mixed with molasses, and bran with oil, all poisoned with lead arsenate, calcium arsenate, or sodium fluosilicate, and one of raisins and shorts poisoned with sodium fluosilicate. The rate of kill was more rapid with baits containing lead or calcium arsenate, but in some cases total mortality was higher with sodium fluosilicate. In earlier tests, molasses mixed with bran was much more effective than when mixed with bran and sawdust or sawdust alone.

Dormant sprays (containing 2 and 4 per cent. actual oil) of D N oils (oils impregnated with dinitro-o-cyclo-hexylphenol), lubricating oil emulsion and creosote tar oil controlled *Chionaspis pinifoliae*, Fitch, on pine, but the first two, according to the concentration, caused variable amounts of damage to the foliage. Young scales of the first and second broods were effectively controlled by summer sprays of 1 and 2 per cent. summer oil emulsion, or of nicotine sulphate (1 : 800) with 1 per cent. oil emulsion or with 4 per cent. soap (solids).

The needle miners, *Argyroploce* (*Olethreutes*) *abietana*, Fern., and *Recurvaria piceaella*, Kearf., were injurious to spruce in some nursery plantings. Tests of various insecticides in the summer of 1936 and the spring of 1937 suggest that oil sprays have some effect on the eggs and young larvae, and that oil with lead arsenate or with nicotine is toxic to the overwintering larvae. Owing to the hot dry weather in 1936, summer oil emulsion caused noticeable foliage injury, particularly on parts of the trees exposed to the direct rays of the sun.

In view of the damage caused to peas by successive outbreaks of *Macrosiphum onobrychis*, Boy (*pisi*, Kalt.), control measures are briefly reviewed. Discussion of recently developed methods is, however, deferred until another season's work has been completed. Beans were sown on various dates from late April to mid-June to estimate the effect on yield of control measures against *Epilachna varivestis*, Muls. (*corrupta*, Muls.) on plants of different ages. The maximum yield was obtained from the earliest plantings, irrespective of infestation. Pickings from these were made in late June and early July when first brood larvae were present, and it was apparent that the plants had grown and podded under optimum conditions before the yield could be affected by larval feeding. The yield and quality of the beans was inversely proportional to the lateness of planting, chiefly owing to adverse growing conditions during midsummer. In plantings picked in late July and early August, at the end of the first and the beginning of the second brood, treatment effected a marked improvement. Preliminary tests on autumn-grown lima beans indicated that the effectiveness of sprays of timbo powder is not reduced by combination with Bordeaux mixture.

The first brood of *Heliothis armigera*, Hb. (*obsoleta*, F.) was relatively scarce on Long Island in 1936, and serious injury to maize was not generally observed until after mid-August. The proportion of infested ears then rose steadily, and over 90 per cent. were affected during September. The exact source of early infestations is being considered, as no pupae appear to survive the winter. A preliminary survey in the wholesale markets of New York City showed that large quantities of green maize containing live larvae were received from the southern states and sold from early April until early July when the local maize appeared [*cf.* **24** 560]. The value of tobacco cloth for protecting plantings of sweet maize [**25** 373, etc.] was confirmed. Mechanical devices for protecting the ears are described [*cf.* **24** 428], but none is recommended for general use. Clipping tends to discolour the husks and lessens their commercial value.

SCHOENE (W. J.) & UNDERHILL (G. W.). **Resistance of certain Varieties of Apple Trees to Injury by the Leafhopper** (*Empoasca fabae*).—*Tech. Bull. Va agric. Exp. Sta.* no. 59, 16 pp., 9 figs., 23 refs. Blacksburg, Va, February 1937. [Recd. 1938.]

The following is the authors' summary: The potato leafhopper, *Empoasca fabae*, Harr., attacks the tender terminals of many species of plants, causing a pronounced curling of the foliage. The severe injury to apple foliage occurs over a period from 20th May to 1st July. The leafhoppers continue to feed throughout the remainder of the growing season but are present in smaller numbers. At Richmond, Virginia, the adults may be found on nursery apple trees from 15th April until frost. It was possible to study large plantings of apple varieties in parallel rows. Some varieties of apple trees were much more seriously injured than others; for example, the leaf curl was very pronounced on the Early Harvest, Yellow Transparent, and Albemarle Pippin varieties and almost absent on Stayman Winesap, Winesap and Jonathan. Altogether 58 varieties of apples have been studied and classified according to their susceptibility to leafhopper injury.

It is evident from the literature that the leafhopper is not equally injurious to all varieties of plants on which it feeds, but that the differences in degree of injury produced are less marked when the insects are very numerous. In the different years these observations were made there was some variation in the number of leafhoppers and also the amount of injury, but the range in injury was fairly consistent.

The susceptibility of apple varieties to leafhopper injury varied inversely with the amount of pubescence of the foliage. Varieties of apples having foliage with scant pubescence were subject to serious leaf curl; whereas, the varieties which had leaves with dense pubescence were curled only slightly or not at all [*cf. R.A.E.*, A **24** 68].

BOBB (M. L.) & HOUGH (W. S.). **Paradichlorobenzene-Oil Preparations for Control of Peach Tree Borer.**—*Virginia Fruit* **26** no. 1 pp. 74–83. Staunton, Va, January 1938.

An account is given of experiments carried out in two counties in Virginia in 1936 and 1937 on the control of larvae of *Aegeria* (*Conopia*) *exitiosa*, Say, in peach trees by spraying the base of the trunk with emulsions of various oils impregnated with paradichlorobenzene [*cf. R.A.E.*, A **25** 32, 237, etc.], or by applying paradichlorobenzene crystals in a ring round it. With either method, treatment in autumn was more effective than treatment in spring, and it was necessary to mound the trees in order to obtain maximum mortality of the larvae. The spraying method was slightly the more effective, but not sufficiently so to justify the increased cost. If it is applied on slopes, it is necessary to level the ground round the trees in order to reduce the run-off of the liquid.

HOUGH (W. S.). **Dormant Sprays for Virginia Orchards.**—*Virginia Fruit* **26** no. 1 pp. 134–138. Staunton, Va, January 1938.

The author summarises the results of work during recent years on dormant sprays for the control of the San José scale [*Aonidiella perniciosa*, Comst.], cherry scale [*Aspidiotus forbesi*, Johns.] and white scurfy scale [*Chionaspis furfura*, Fitch], all on apple in Virginia. Before the spray is applied, the trunks and large limbs of the trees should be scraped to remove loose bark. Spraying is as effective against the scales in autumn as in spring, but for the control of Aphid eggs sprays should be stronger if applied in autumn. In the control of moderate infestations of San José scale or cherry scale, oils of viscosities of 110–135 seconds Saybolt give about the same results as heavier oils, but light oils (viscosity 85 seconds) are less effective. Oil sprays (2–3 per cent.) give a higher mortality of these two Coccids than lime-sulphur (12 : 100), but after treatment with the latter they do not multiply normally through the summer ; the addition of 2 per cent. lime-sulphur to the dormant oil sprays appeared in some cases to increase their effectiveness.

Against *Chionaspis furfura*, which overwinters in the egg stage, lime-sulphur (12 : 100) is not effective, and 4 per cent. petroleum oil has been only moderately satisfactory, because the oil is not always deposited uniformly over the surface of the bark. A spray of 3 per cent. petroleum oil and 2·5 per cent. tar oil, and one of 2 per cent. petroleum oil containing 9–10 oz. dinitro-o-cyclohexylphenol both gave good control, as did mixtures of 2–3 per cent. petroleum oil with 0·4 per cent. lauryl rhodanate ; the effect of this thiocyanate on fruit buds, has, however, not yet been ascertained. Excellent control of *Chionaspis* was obtained in a heavily infested orchard as a result of destruction of the crawlers and young scales by sprays of 2 per cent. summer oil emulsion containing 4 lb. nicotine bentonite per 100 U.S. gals., which were applied, primarily for the control of codling moth [*Cydia pomonella*, L.], 7 times at intervals of 10–18 days from early June. Tar distillates at 2½ per cent. give excellent control of Aphid eggs whether applied in autumn or spring ; but at 2 per cent. they are only effective if applied in March. Results of two seasons indicate that sprays of petroleum oil containing dinitro-o-cyclohexylphenol killed eggs of Aphids and *Chionaspis* and were slightly more effective than oil alone against San José and cherry scales. They should not be used during the delayed dormant period as they might cause very serious injury to the buds. They were effective when applied in the autumn, provided that the content of dinitro-o-cyclohexylphenol was not much below 10 oz. in 100 U.S. gals. diluted spray ; in March excellent control of Aphids was obtained by sprays containing about 7·4 oz.

The use of tar oil when green first appeared in the buds killed fruit spurs, small twigs and buds, and petroleum oil sprays that had "layered out" in the tank were also injurious.

In answer to a question, the author stated that 2 applications of the ordinary 3 per cent. emulsion spray were better than 1, as better coverage was given. The trees were not seriously injured.

SMITH (F. F.) & UTTER (L. G.). **The Iris Thrips and its Control by Hot Water, with Notes on other Treatments.**—*Circ. U.S. Dep. Agric.* no. 445, 12 pp., 6 figs., 4 refs. Washington, D.C., October 1937.

An account is given of the bionomics and control of *Bregmatothrips iridis*, Watson, on iris in New York [*cf. R.A.E.*, A **21** 613]. It is now widely distributed across the northern United States and possibly occurs in Montreal, but, except for one record [*loc. cit.*], species of iris are the only plants on which it has been found.

The adult females, which overwinter in contact with the young leaf buds, are sluggish at low temperatures, but at 50°F. or above become active within an hour, feed and, in a few days, oviposit beneath the epidermis of the leaf tissue. Near New York, oviposition in the field usually begins in late April and development occupies about a month. All stages, including the comparatively infrequent alate females, are present from the end of May until October, when oviposition ceases. The population reaches its maximum in late June, when the plants are flowering, and infestation then spreads most rapidly. The Anthocorid, *Orius insidiosus*, Say, preys on the larvae, pupae and adults. The adult thrips usually remain in the shelter of contiguous leaves or in the leaf sheaths, but sometimes feed in exposed situations. In the early part of the day, many of the larvae feed on the foliage and flower buds. Flower-injury has been observed only in wild and cultivated Japanese iris, particularly late-blooming varieties. Much of the damage observed is probably due to *Taeniothrips simplex*, Morison, as *B. iridis* generally leaves the flowers after feeding on the inner surfaces of the bracts. In some cases, differences in the degree of injury on adjacent plants in the early part of the season appear to be correlated with the number of overwintered thrips in each clump. After flowering, and migration of the thrips, infestation and injury tend to become more uniform. Plants with their bases submerged in pools or brooks during the summer may be as severely damaged as those in fields or gardens.

In experiments on control, burning off the old foliage in early spring or prolonged submersion of the plants in cold water before flowering were ineffective. All the thrips were killed when plants that had been freed from soil and divided and cut back were immersed in muslin bags in water at 110°F. for 30 minutes from the time the temperature became stabilised. When, with small lots of material, the water temperature remained unchanged, a preheating period of 5 minutes was allowed. Shorter periods of immersion at higher temperatures gave good results, but the treatment described caused minimum injury and setback to the plants. Plants were also treated *in situ* by pressing a cylinder into the ground round them, pouring into it about 2 U.S. gals. water at 120°F. to warm the surface of the soil, and then adding water at 114°F. until the foliage was covered. Radiation and the cooling effect of the soil and foliage lowered the water temperature to 110–111°F., and this was maintained by the addition of water at 114°F. Very good control was obtained in 1936 by spraying with a mixture of derris powder (0·025 per cent. rotenone in the diluted spray) and sulphonated castor oil (1 : 400), or by fumigating for 1 hour with burning tobacco powder (12·5 per cent. nicotine) beneath a paper and canvas hood at the rate of 2 oz. per 100 cu. ft. ; 6 and 5 applications of the spray and fumigant, respectively, were given at approximately weekly intervals from 15th May to 16th June, the fumigant not being applied in the last week. Further tests in 1937 confirmed the results. Moderate control was obtained both in 1936 and 1937 with sprays containing manganese arsenate and brown sugar, and poor control in 1936 both with lead arsenate and brown sugar and with lauryl thiocyanate. In both seasons plants sprayed with derris appeared to be much more healthy than those treated with other materials. Better control was obtained in the preflowering period than later in the year. In tests in 1934 a spray containing Paris green and brown sugar caused severe injury to the foliage of Japanese iris ; naphthalene flakes scattered on the soil caused a varying degree of injury to greenhouse plants and did not control the thrips ; and unsatisfactory results were also obtained by fumigating with calcium cyanide or carbon bisulphide.

HIXSON (E.) & SOOTER (C. A.). **Temperatures at which Boll Weevils freeze.**—*J. econ. Ent.* **30** no. 6 pp. 833–836, 1 fig., 7 refs. Menasha, Wis., December 1937.

The following is the authors' summary of studies made in Oklahoma : The cotton boll weevil [*Anthonomus grandis*, Boh.] is much more resistant to cold than was formerly supposed. The undercooling temperatures of 991 boll weevils show a range from 26·6° to —9·4°F. Those undercooled in November and February were the most resistant, those undercooled in December and March were the least resistant. Winters having low minimum temperatures were followed by small field populations of hibernated weevils whether the population the previous year was large or small.

CHAPMAN (A. J.) & CAVITT (H. S.). **Possibilities of reducing overwintering Pink Bollworm Population in the Soil as shown by Stripping Tests.**—*J. econ. Ent.* **30** no. 6 pp. 837–838. Menasha, Wis., December 1937.

In experiments in Texas, the average numbers of larvae of *Platyedra* (*Pectinophora*) *gossypiella*, Saund., hibernating in the soil under cotton plants from which squares, blooms and bolls had been stripped on 1st and 15th October and 1st and 15th November were 6·4, 12·4, 20·6 and 26·4 per sq. yd, respectively, in 1935, and 2·2, 3·6, 6·7 and 6·9 in 1936. The smallness of the difference in infestation between plots stripped on 1st and 15th November 1936 is attributed to an early frost, which occurred on 4th November. These results indicate that early ripening and picking of the crop and early clearing of the fields would greatly reduce the overwintering population of *P. gossypiella*.

RUDE (C. S.). **Parasites of Pink Bollworm in northern Mexico.**—*J. econ. Ent.* **30** no. 6 pp. 838–842, 2 refs. Menasha, Wis., December 1937.

In several cotton fields in the Laguna, an irrigated district of northern Mexico, 75 per cent. of the larvae of *Platyedra* (*Pectinophora*) *gossypiella*, Saund., in blooms were killed by indigenous parasites. These are increasing in importance, but do not prevent heavy infestations. A Tachinid of the genus *Anachaetopsis* was reared on numerous occasions from larvae found in blooms. *Microbracon platynotae*, Cush., is generally distributed over the Laguna and is probably the most abundant of the parasites there. It attacks larvae in squares, blooms and bolls. It is easily reared in the laboratory, and the technique for this is described. Several thousand were reared and liberated in a field in which 90 per cent. of the blooms were infested. Three weeks later, infestation was reduced to 50 per cent., and the population of the parasite, which was not known to be present before, was large. It was frequently found on flower heads of *Helianthus ciliaris* infested by large numbers of larvae of an undescribed Tineid of the genus *Isophrictis*, which became parasitised when exposed to the Braconid. *M. mellitor*, Say, occurs generally over the cotton-growing areas of northern Mexico and parasitises larvae of the boll weevil [*Anthonomus grandis*, Boh.] and *P. gossypiella* in squares, blooms and bolls. It may be reared with moderate success in the same way as *M. platynotae*. *Perisierola cellularis* var. *punctaticeps*, Kieff., parasitises larvae of *Platyedra* in the open blooms or wherever they are accessible. The female drags the larvae considerable distances between paralysing them and ovipositing on them. This Bethylid is easily reared ; the females deposit an average of 6 eggs per day and as many as 15 parasites may develop on a single host. At about 80°F., the egg stage lasts about 20 hours, and the larval and pupal stages 10–13 days. It is believed that this parasite effects considerable control of *P. gossypiella*. *Catolaccus hunteri*, Crwf., a parasite of the boll weevil, is thought also to parasitise *P. gossypiella*. *Zatropis incertus*, Ashm., *Goniozus* sp., *Angitia* sp., and *Chelonus albobasilaris*, Ashm., also emerged from collections of squares and blooms containing many bollworm larvae and few boll weevils, and *C. texanus*, Cress., was collected by sweeping in a cotton field. Attempts were made to establish four parasites that do not occur naturally in the region [*cf.* next abstract]. Of these, *C. blackburni*, Cam., was recovered some distance from the point of release, but *Pimpla* (*Exeristes*) *roborator*, F., *M. brevicornis*, Wesm., and *M. kirkpatricki*, Wlkn., do not appear to have become established.

NOBLE (L. W.) & HUNT (W. T.). **Imported Parasites of Pink Bollworm at Presidio, Tex., 1932–36.**—*J. econ. Ent.* **30** no. 6 pp. 842–844. Menasha, Wis., December 1937.

During the years 1932–36, 6 species of foreign parasites of *Platyedra* (*Pectinophora*) *gossypiella*, Saund., were imported into Texas and propagated in the laboratory at Presidio. With the exception of *Elasmus platyedrae*, Ferrière, the stock of which died, all were liberated during at least one season in Texas, and some in Mexico and Porto Rico, and all were recovered during the summer in which they were released, but collections in the following years did not show that any had become established. Two strains of *Pimpla* (*Exeristes*) *roborator*, F., were introduced, one from southern Europe where it normally develops in the European corn borer [*Pyrausta nubilalis*, Hb.], and one from Egypt. Breeding of the European strain was discontinued because no alternate hosts could be found when *P. gossypiella* was not available, and the Egyptian strain was liberated only in 1936. The only difference so far observed between the two strains when reared on *P. gossypiella* is that the sexes occur in about equal numbers in the Egyptian strain, while males are much the more numerous in the European strain. Breeding and liberation of *Microbracon brevicornis*, Wesm., from southern Europe have been discontinued, as the parasite, which has no resting period and cannot parasitise hibernating larvae, cannot survive the winter. *M. kirkpatricki*, Wlkn., introduced from Africa, has not been found to overwinter, but as it is able to parasitise hosts not exposed, further breeding and liberation seem justified. A Hawaiian strain of *M. mellitor*, Say, the native strain of which exercises negligible control, was found to overwinter in the larval stage with a survival of 61·58 per cent. It is of considerable importance in Hawaii. *Chelonus blackburni*, Cam., also imported from Hawaii, oviposits in the egg of its host but completes its development in the larva. It breeds readily in the laboratory in *Ephestia kuehniella*, Zell. It is thought that it will be able to overwinter in larvae of *P. gossypiella* in the soil.

GAINES (R. C.). **Tests for Boll Weevil Control using Latin Square Plat Arrangement, Tallulah, La., 1936.**—*J. econ. Ent.* **30** no. 6 pp. 845–848, 1 fig. Menasha, Wis., December 1937.

Experiments on the control of *Anthonomus grandis*, Boh., with calcium arsenate dusts were made in Louisiana in 1936, using the Latin square arrangement [*R.A.E.*, A **25** 428]. The plots, four of which were left untreated, four treated with calcium arsenate, four with calcium arsenate and lime (50 : 50) and four with calcium arsenate and sulphur (50 : 50) were artificially infested. Treatment was begun on 28th July and continued at intervals of about 4 days until 26th August, and the dusts were applied at the rate of rather more than 7 lb. per acre per application. On 27th July, the average percentages of punctured squares on the four groups of plots were 12·9, 14·6, 17·5 and 14·4, respectively. On 10th August, they were 50·4, 16·9, 25·4 and 23·9. Conditions were favourable to the increase of the weevils during July, but very unfavourable during August and September. There were considerably more blooms and bolls on all the treated plots than on the control plots, slightly more on those that received calcium arsenate and sulphur than those that received calcium arsenate and lime, and most on those that received calcium arsenate alone. The height of the plants and the number of plants per acre were very uniform. The data on yield were analysed by the method of analysis of variance. The plots treated with calcium arsenate, calcium arsenate and sulphur and calcium arsenate and lime produced respectively 10·9, 9·3 and 6·9 per cent. more than the controls. All these differences were significant, but there was no significant difference in control between any two of the calcium arsenate treatments.

THOMAS (F. L.) & OWEN, jr. (W. L.). **Cotton Flea Hopper, an ecological Problem.**—*J. econ. Ent.* **30** no. 6 pp. 848–850. Menasha, Wis., December 1937.

Injury to cotton in Texas by *Psallus seriatus*, Reut., is usually greater on heavy types of soil than on light, and in the interior of a cotton field than on the edge or on rows adjacent to other crops when strip planting is practised. This can be explained on the basis of the fact that cotton is not a preferred food-plant of the Capsid, but is acceptable when it is succulent, as it is when the first-generation adults are searching for food-plants. In the area where the soil is heavy, the fields are usually large, much land is in cultivation and alternative spring food-plants are comparatively scarce, while the planting of tall crops such as maize near or in strips through the cotton fields, which is a common practice, may cause the migrating fleahoppers to fly higher and perhaps be carried further by wind than would otherwise be the case. Heavy soils, through their water-retaining capacity, keep the cotton succulent for a longer time than light ones. Strip planting and crop rotation are recommended to reduce infestation.

EWING (K. P.) & McGARR (R. L.). **Cotton Flea Hopper Control in 1936.**—*J. econ. Ent.* **30** no. 6 pp. 850–854, 4 figs. Menasha, Wis., December 1937.

In 1936, 4 small-scale and 4 large-scale experiments were carried out in Texas to compare sulphur, Paris green and sulphur (1 : 9) and calcium arsenate and sulphur (1 : 4) for the control of *Psallus seriatus*, Reut., on cotton [*cf. R.A.E.*, A **25** 413, 428]. The sulphur was 97–98 per cent. pure, with 98–100 per cent. passing through a 325-mesh screen. Infestation was very light, and excessive rains lowered the yield of cotton. In the small-scale experiments the sulphur, Paris green and sulphur, and calcium arsenate and sulphur were applied at the respective rates of 12·33, 12·73 and 12·86 lb. per acre, and in the large-scale ones at 14·5, 13·2 and 14·4 lb. per acre. There was practically no difference between the control effected by the two mixtures, but both gave better control than sulphur alone. Also, in the small-scale experiments, plots dusted with the mixtures had approximately the same number of blooms, those dusted with sulphur had about 86 per cent. as many and the untreated ones about 38 per cent. as many. The average gains in pounds seed cotton per acre in the 8 experiments from treatment with Paris green and sulphur, calcium arsenate and sulphur, and sulphur alone were 128·9, 111·9 and 111·1, respectively.

DUNNAM (E. W.) & CLARK (J. C.). **Thrips Damage to Cotton.**—*J. econ. Ent.* **30** no. 6 pp. 855–857. Menasha, Wis., December 1937.

Severe injury by thrips, principally *Frankliniella tritici*, Fitch, *F. fusca*, Hinds, *F. runneri*, Morgan, and *Sericothrips variabilis*, Beach, was observed in experimental plots of cotton in Mississippi during the spring of 1936. A study was made of the variations in damage caused to plants of 40 varieties when different numbers of stalks were left on a hill and when the date of chopping was delayed, and the effect of damage on the time of fruiting, the quantity of cotton produced and the quality of the lint. In plots chopped early and in which there were, on an average, 2·79 stalks on a hill, the percentage of plants with the terminal bud destroyed was 9·24. In plots chopped early but thinned to 1 stalk on a hill, it was 21·02, and in plots on which chopping was delayed for one week and there were 2·08 stalks on a hill, it was 20·27. Apparently, the delayed chopping favoured an increase in the population of thrips on the larger weeds among the cotton. Damage delayed the setting of the bolls by 10–14 days, and reduced the average number of bolls produced by 7·72 per cent. and the amount of seed cotton by 13·38 per cent. Commercial classification of the lint showed a loss in staple length on damaged plants of 7 varieties. No varietal difference in susceptibility was observed. It is probable that under field conditions the loss resulting from infestation by thrips would be greater, as the retarded production of bolls would increase infestation by the boll weevil [*Anthonomus grandis*, Boh.].

WATTS (J. G.). **Species of Thrips found on Cotton in South Carolina.**—*J. econ. Ent.* **30** no. 6 pp. 857–860, 6 refs. Menasha, Wis., December 1937.

A list is given of 13 species of Thysanoptera found on cotton in South Carolina. The two not already noticed [*R.A.E.*, A **24** 783] are *Thrips panicus*, Moult., taken in 1936, probably for the first time in the United States, and thought to be only of local importance, and *Stomatothrips flavus*, Hood, which is rare in South Carolina, where it has been recorded on cotton only. In 1936, *Frankliniella tritici*, Fitch, was only the third most abundant species, and *Sericothrips variabilis*, Beach, constituted about 75 per cent. of the entire population. *F. williamsi*, Hood, is regarded as a possible potential source of injury, as it is frequently found on cotton and its habits are practically identical with those of the other economic species.

WATTS (J. G.). **Reduction of Cotton Yield by Thrips.**—*J. econ. Ent.* **30** no. 6 pp. 860–863, 1 ref. Menasha, Wis., December 1937.

Injury to cotton by thrips in the United States may be to the mature plant, as is usual in the west, or to seedlings and small plants, as is usual in the eastern part of the cotton belt. This paper deals with the latter type, which generally results in an excessively branched plant. The attack is extremely sudden and brief. In South Carolina in 1936, only a few scattered adults were observed on 4th May, larvae were abundant and doing serious damage by 13th, and the population had begun to diminish by 20th, after which date very little damage was done. Observations were made on 100 severely injured plants, in which the terminal bud had been killed and two or more main branches had developed, and 100 uninjured or very slightly injured ones. The first blossoms appeared ten days earlier on normal plants than on injured ones, and the last appeared one day later. Many of the mature plants in the injured series were below the average in vitality. Only 65 per cent. as many blooms opened on the injured plants. The delay in fruiting increases the damage done by the boll weevil [*Anthonomus grandis*, Boh.]. The injured series produced only 60 per cent. as many mature bolls and 59 per cent. as much seed cotton. In the field from which the data were taken, 56 per cent. of the terminal buds were killed in the seedling stage.

FLETCHER (R. K.). **Leafhoppers found on Cotton.**—*J. econ. Ent.* **30** no. 6 pp. 863–864. Menasha, Wis., December 1937.

A list is given of 21 Jassids found on cotton in east-central Texas during 1927–37, showing the months in which each was taken and other food-plants in some cases. The records were incidental to other investigations, and it is probable that most of the species occurred on cotton only accidentally, but *Oncometopia undata*, F., *O. lateralis*, F., *Homalodisca triquetra*, F., and *Aulacizes irrorata*, F., were widespread and common, and *Graphocephala versuta*, Say, was abundant in certain areas. All five of these leafhoppers fed on the squares and small stems. In addition the Membracid, *Stictocephala festina*, Say, was frequently taken on bottomland cotton, and two Fulgoroids were also observed.

SMITH (G. L.) & SCALES (A. L.). **Toxicity of a Number of Insecticides to three Cotton Insects.**—*J. econ. Ent.* **30** no. 6 pp. 864–869, 2 refs. Menasha, Wis., December 1937.

The following is substantially the authors' summary of dusting tests made in Louisiana in 1936 with various insecticides : Against *Anthonomus grandis*, Boh., calcium arsenate was more effective than any of the insecticides tested, with the exception of cubé (4·9 per cent. rotenone), Paris green, and mixtures of calcium arsenate and Paris green. Against *Alabama argillacea,* Hb., calcium arsenate caused about the same mortality as pyrethrum (0·76 per cent. total pyrethrins), Paris green or mixtures of calcium arsenate and Paris green. Against nymphs and adults of *Lygus pratensis*, L., pyrethrum (0·76 per cent. pyrethrins) and Paris green caused the highest mortalities. Pyrethrum and pyrethrum mixtures with sulphur, Paris green and cubé are promising insecticides against this insect.

REINHARD (H. J.). **Sorghum Webworm Studies in Texas.**—*J. econ. Ent.* **30** no. 6 pp. 869–872. Menasha, Wis., December 1937.

Celama sorghiella, Riley, is one of the major pests of grain sorghums in eastern Texas and causes severe losses, particularly in rainy seasons. In a heavily infested field, 70 per cent. of the grain may be injured. It also attacks a number of closely allied graminaceous plants, such as Johnson grass, and occasionally the silks and tassels of maize. All stages of this Arctiid, of which a study was made from 1932 to 1934, are described. The egg stage lasts 3–4 days at a mean temperature of 80°F. or over and 5–6 days at the beginning and end of the growing season. In 206 larvae of 5 generations reared to maturity under laboratory conditions between 10th May and 26th September 1932, 4–7 instars were observed, most individuals being fully grown at the end of the fifth. In the case of such individuals, the average duration of the stage was 13·5 days. The first 4 instars averaged just over 2·5 days each. The newly-hatched larvae usually feed on the flowering parts of the plant. In the later instars, they feed voraciously, and one larva may consume the greater part of 12 or more seeds in 24 hours. No webs were spun for protection during feeding and moulting, but a white silken cocoon in which pupation takes place is spun before the beginning of the prepupal stage. Among 523 pupae of five generations, the pupal stage lasted 4·7–9·2 days. The adults are more active during the night than the day. Eggs are laid singly, usually on the flowering parts or seed of the food-plant. The greatest number of eggs laid in the laboratory by one female was 169, but dissections of females at the end of the oviposition period indicated that the number laid in the field is probably much larger. Adults in close confinement, supplied with moisture, lived up to 23 days.

C. sorghiella overwinters on the food-plant as a mature larva. Hibernation begins in October or November, but there is occasional activity during the winter on warm days. The larvae begin to pupate when daily mean temperatures average 58° or 60°F., usually during

March. During 1933–36, adults of the overwintered generation emerged from late March to mid-June. In 1934, 6 generations were reared in the laboratory between 21st April and 25th September. The first required 20–31 days to develop, the second 19–25, and the third, fourth and fifth 18–21. Observations on the sixth generation were made on 34 individuals, of which 11 hibernated. The others became adults in late September, but did not produce any eggs, though in favourable weather in the field reproduction continues until late October, which allows of a partial seventh generation. The greatest damage is done by larvae of the fourth and later generations.

Apanteles sorghiellae, Mues. [*R.A.E.*, A **22** 128] seems to be the only parasite of economic importance. The control methods recommended are all cultural and include ploughing stubble during autumn or early winter and burning over neighbouring Johnson grass, using all infested crops stored as forage before the spring, early planting, and using improved or pure strain seed and planting only one variety in a field.

Ben-Amotz (Y.) & Hoskins (W. M.). **Factors concerned in the Deposit of Sprays. III. Effects of wetting and emulsifying Powers of Spreaders.**—*J. econ. Ent.* **30** no. 6 pp. 879–886, 3 figs., 10 refs. Menasha, Wis., December 1937.

The following is the authors' summary : The deposit of oil obtained upon a standard bees-wax surface from a fixed volume of an emulsion containing the protein spreaders, haemoglobin or blood albumin, increases as small amounts of the spreaders are added, reaches a maximum at a concentration characteristic for each, and decreases as larger amounts are used. On the other hand, all emulsions containing the soap, sodium oleate, deposit less oil than the mechanical mixture of oil and water. These different behaviours are explained on the basis that deposit is favoured by an increase in wetting power until the latter is so great that much of the surface is continually covered during the application. Wetting power must be studied by dynamic methods, for static measurements are misleading. Emulsifying power always decreases deposit. Application of these conceptions explains the two types of deposit curves. It is believed that a maximum will be obtained at some intermediate concentration of all typical wetting agents, and that all typical emulsifiers will decrease deposit at all concentrations.

Michelbacher (A. E.). **Control of the Garden Centipede in California.**—*J. econ. Ent.* **30** no. 6 pp. 886–891, 1 fig., 1 ref. Menasha, Wis., December 1937.

Winter flooding is known to be the best method of controlling *Scutigerella immaculata*, Newp., in asparagus fields in California [*cf.* *R.A.E.*, A **20** 357], and flooding during the warmer parts of the year has recently given promising results on field crops in the Delta region of the Sacramento river. During May 1934, 88 per cent. control in a heavily infested field was obtained by flooding for about 6 days to a depth of 1–6 ins. Water only a few inches deep warmed more quickly than deeper water. During the summer, the population was built up again, and sugar-beet planted in the following spring was severely injured. By mid-summer, the population was estimated as 8,000,000 per acre. During early October 1935, the field was flooded again. No example of the pest was found in November, and sugar-beet planted in January 1936 produced an excellent stand. During that month, two examples were recovered in 12 samples each of an area 4 ins. in diameter, none in March and April, one in May and 12 in August, most of them small. The field was flooded again during early September, the crop having been harvested late in July, and no infestation was found in December. Flooding for a week or less at the hottest part of the summer as soon as the crop is harvested should free the land of infestation for at least two years.

The cultural methods used in growing various crops also have an effect on the population of the pest. The very damp conditions used in growing onions are unfavourable to it. It was apparently little affected by calcium cyanamide; improved growth that resulted in a single instance was probably due to the correction of a nitrogen deficiency in the soil. Carbon bisulphide [*cf.* **21** 588] at the rate of 2 oz. per hole in holes 18 ins. apart, gave complete control in moist soil of which the temperature at the 6-inch level was only 48–52°F.; the holes in alternate rows were staggered to reduce the distance that the gas would have to diffuse through the soil.

EYER (J. R.). **Physiology of Psyllid Yellows of Potatoes.**—*J. econ. Ent.* **30** no. 6 pp. 891–898, 6 figs., 6 refs. Menasha, Wis., December 1937.

A study in New Mexico of "Psyllid yellows" of potatoes caused by nymphs of *Paratrioza cockerelli*, Šulc [*cf. R.A.E.*, A **21** 605] showed that, in addition to the mechanical rupturing of the cells and the withdrawal of carbohydrates, cell proteins are broken down, and such disintegration products as arginine, tyrosine and tryptophane were detected. Regardless of insecticides or fertilisers applied, diseased plants were markedly deficient in nitrates. The injury to the border parenchyma appears to be extended laterally, for sections through the midrib and petioles show necrosis of the phloem or principal carbohydrate-conducting tissues. The modification caused by injury in the distribution of carbohydrates in leaf, root, stem and tuber over a period of 24 hours are discussed in detail. In diseased plants, the chloroplasts are distorted and are smaller and more lightly pigmented than in healthy ones, and the percentage of chlorophyll and carotin is decreased.

HOERNER (J. L.). **A new Gooseberry Pest,** *Stretchia plusiaeformis* **Hy.**—*J. econ. Ent.* **30** no. 6 pp. 900–902, 2 figs. Menasha, Wis., December 1937.

The Noctuid, *Stretchia plusiaeformis*, Hy. Edw., was present in Colorado in 1892, but very little is known of its habits or food-plants. In 1931, injury to gooseberries in the south-east was reported, and an investigation in 1932 showed that it was being caused by cutworms, the adults reared from which were identified as *S. plusiaeformis*. The adults emerge in late March and early April and oviposit on twigs and buds of gooseberry. The larvae hatch in 7–8 days and feed on the expanding leaves. At about the third instar, they shelter in the leaves and earth at the base of the plants, and when about full-grown, they prefer the seeds, which they obtain by cutting a hole in the side of the developing berry. Sometimes, 90 per cent. of the berries are injured. The full-grown larvae pupate in cells in the soil. The pupal stage lasts throughout the summer, autumn and winter, there being only one generation a year. The best control was obtained by applying a spray of 3 lb. lead arsenate in 100 U.S. gals. water just as the leaves were expanding and again 10 days later if necessary. A mash containing bran, Paris green and molasses gave some control, and trimming off the lower branches and close cultivation through the summer appeared to reduce the injury during the following year.

BALL (E. D.). **Problem of the Range Grasshopper.**—*J. econ. Ent.* **30** no. 6 pp. 904–910, 1 ref. Menasha, Wis., December 1937.

There are three major grasshopper problems in the United States, *viz.*, infestation of the overgrazed, eroded and abandoned central region, which constitutes a serious problem that cannot be solved by entomology alone, infestations in the western irrigated valleys, which are relatively simple to control, and the range grasshopper problem, which is the subject of this paper. The most important range grasshoppers all feed on grass, mostly on a single one or a few related species, and they are not migratory. Unlike the farm, the range is a balanced biological entity, and control must be based on the encouragement of natural factors that ordinarily reduce the annual grasshopper population. Points to be taken into account are the cyclic nature of the population, the value of local predators in years of scarcity, and the increased importance of migratory predators (chiefly birds), parasites and diseases in times of abundance. The periodic outbreaks are correlated with climate.

GOODHUE (L. D.) & GOODEN (E. L.). **Some physical Properties of commercial Paris Greens.**—*J. econ. Ent.* **30** no. 6 pp. 913–917, 2 figs., 6 refs. Menasha, Wis., December 1937.

The following is the authors' summary : The particle-size distribution of nine commercial samples of Paris green has been determined by sedimentation analysis. Except for one air-floated sample, the Paris greens were found to be coarser than the samples of calcium arsenate studied in a previous investigation [*R.A.E.*, A **25** 692]. The particle form is indicated in photomicrographs, which also gave a check on the particle size as determined by sedimentation analysis. The loose bulking values were in approximately the same order as the results by sedimentation and may be used as a rough measure of the fineness of Paris green. The angle of slope indicates that in general Paris green will flow easily and dust well. The density of each sample was determined to check the purity of the samples and to obtain some idea of the uniformity of the different brands. Little variation in density was noted.

DE ONG (E. R.). **Tolerance of Animals to Pyrethrum Extracts.**—*J. econ. Ent.* **30** no. 6 pp. 921–927, 1 fig., 3 refs. Menasha, Wis., December 1937.

Experiments in California in 1933 and 1934 proved that oil sprays containing pyrethrum extract, such as are used on range land for the control of hibernating sugar-beet leafhoppers [*Eutettix tenellus*, Baker], are harmless to sheep, including pregnant ewes and lambs from them.

The animals were allowed to feed for 48–81 days on fodder that had received a heavy dosage of spray. When they had a choice, they showed a preference for sprayed material.

DECKER (G. C.) & ANDRE (F.). **Winter Mortality of Chinch Bugs in Iowa.**—*J. econ. Ent.* **30** no. 6 pp. 927–934, 3 figs., 2 refs. Menasha, Wis., December 1937.

A survey of southern Iowa revealed the occurrence of extensive mortality of *Blissus leucopterus*, Say, in the winter of 1934–35. In half of the area mortality was over 60 per cent. and in some parts over 80 per cent. The winter was generally mild, and there were no extremely cold periods. The mean average temperature for December, January and February was 1·9°F. above the average for 62 years, and the precipitation only 0·46 inch below the average for that period. The minimum temperature recorded was −30°F., the same as that for the preceding winter. Laboratory studies showed that the bugs are not particularly resistant to low temperatures [*R.A.E.*, A **25** 167]. Heavy rains immediately preceding the most severe cold spell of the winter in January, and an absence of snow cover during this period appeared to increase mortality considerably. All types of vegetation made very poor growth in 1934 on account of extreme drought, and the consequent reduction in their insulating value was also an important factor.

JONES (L. S.) & PRENDERGAST (D. T.). **Method of obtaining an Index to Density of Field Populations of Citrus Red Mite.**—*J. econ. Ent.* **30** no. 6 pp. 934–940, 2 figs. Menasha, Wis., December 1937.

The following is largely the authors' summary: An accurate and relatively rapid method of obtaining an index to populations of *Paratetranychus citri*, McG., on *Citrus* in California is described. This method involves the random collection of 50 leaves from each side of a tree and, when present, the selection of three heavily infested fruits from three relatively constant positions. The leaves and fruits from one side of the tree are placed in 800 cc. of a 5 per cent. formalin solution immediately after picking. They are taken out in the laboratory and placed in 800 cc. of a hot 0·25 per cent. solution of potassium hydroxide to remove the eggs. The solutions of formalin and potassium hydroxide are combined, and, if necessary, water is added to make up 1,600 cc. During uniform agitation, a 200 cc. aliquot is removed and filtered. The mites and eggs thus secured, which represent one-eighth of the total number present in the sample, are then counted with the aid of a low-power microscope.

DORST (H. E.) & DAVIS (E. W.). **Tracing long-distance Movements of Beet Leafhopper in the Desert.**—*J. econ. Ent.* **30** no. 6 pp. 948–954, 3 figs., 1 ref. Menasha, Wis., December 1937.

In order to trace the movements of *Eutettix tenellus*, Baker, from the breeding places in the desert to the sugar-beet fields of Utah, small plots of food-plants were established in deserts with no natural vegetation on which dispersal could be detected. The plots were irrigated in the autumn to enable the plants to germinate and maintained throughout the winter so that there was a vigorous growth in the spring. They were established along the river valleys, which form suitable routes between the mountains, and exposure to prevailing winds was taken into consideration ; each was near the dwelling of a man who made daily sweepings. Plots were of various sizes in 1932, but this was unsatisfactory, and in the three following years, all plots were made 100 sq. ft. in area. The data obtained over the 4 years confirmed earlier conclusions that the leafhoppers come from the lower Virgin river basin. Except in 1934, peak collections indicated that the time required for them to travel from points near the breeding place to the south of the beet-growing area, a distance of some 200 miles, was about 2 days. Dispersal is influenced by the climatic conditions, especially wind and temperature. An automatic insect trap [*R.A.E.*, A **19** 550] was tried but proved less satisfactory than the plots.

MENUSAN, jr. (H.) & MACLEOD (G. F.). **Toxicity of High Temperatures to Bean Weevil Eggs.**—*J. econ. Ent.* **30** no. 6 pp. 954–958, 1 fig., 2 refs. Menasha, Wis., December 1937.

The experiments described were made by placing batches of 100 eggs of *Bruchus obtectus*, Say, in test tubes, and immersing the tubes in water kept at a constant temperature. The cultures from which the eggs were obtained and the eggs after exposure were kept at 25°C. [77°F.] and 70 per cent. relative humidity. The treated eggs were examined daily. In some cases, the larva developed within the egg, but was unable to emerge. Such eggs were considered dead. Resistance to heat increased with the age of the eggs. Mortality from exposure to 48°C. [118·4°F.] for 20 minutes was 99 per cent. in eggs two hours old and only about 4 per cent. in eggs more than three days old. When 10 series of eggs, 0–1 day old, were exposed for 10 minutes to each of 11 temperatures ranging from 40°C. [104°F.] to 52°C. [125·6°F.] mean mortality ranged from 4·3 to 99·9 per cent., and when 10 series were exposed to a temperature of 50°C. [122°F.] for 7 periods varying from 1 to 30 minutes, it ranged from 23·9 to 94·6 per cent. In controls it was 3·8. The greatest variation in percentage mortality occurred in the middle of the curves. The time-mortality curve was different in shape from the temperature-mortality curve. Both were asymmetrical. The smallest errors in terms of time and of temperature of exposure were in the high mortality range in the case of variable temperature and in the low mortality range in the case of variable time. The incubation period of eggs surviving heat treatments was prolonged, the delay varying directly with the mortality caused by the treatment.

DEARBORN (F. E.). **Homologs of Paris Green. IV. Insecticides prepared from Animal and Vegetable Oils.**—*J. econ. Ent.* **30** no. 6 pp. 958–962, 8 refs. Menasha, Wis., December 1937.

The method of preparing homologues of Paris green [*cf. R.A.E.*, A **25** 431, etc.] from oils of vegetable and animal origin is described. The products as precipitated are too coarse to be efficient insecticides and must be ground to the desired fineness. The compounds are bluish green, and light and fluffy in texture. They are insoluble in water, and to suspend them in it, a wetting agent, such as alcohol, must be used. They have good adhesive qualities. The addition of a solution of bone glue or gelatine improves suspension in water and tends to reduce the amount of hydrolysis of the compounds.

WALKER (G. L.). **New wetting and spreading Agent for Spray Materials.**—*J. econ. Ent.* **30** no. 6 pp. 962–967, 3 refs. Menasha, Wis., December 1937.

Of a series of samples of petroleum oil sulphonates prepared in 1935 as wetting and spreading agents for sprays for the control of *Pyrausta nubilalis*, Hb., one was selected after laboratory and field tests and manufactured commercially during 1937. This material is a sodium salt of water-soluble sulphonic acids made by acid treatment of petroleum and is known as Ultrawet. It is prepared in the form of a powder and is hygroscopic and approximately neutral. It is compatible with hard water and various insecticides and has a relatively low surface tension and angle of contact. Leaves of bean, potato and apple were readily wetted with dilutions ranging from 1 : 1600 to 1 : 2400. Leaves with more waxy surfaces such as peach, cabbage and nasturtium required dilutions of 1 : 800. At a dilution of 1 : 1600 it caused no injury to a wide range of economic and ornamental plants, but at 1 : 800 it injured maize, peach, grape-vine and pear. Combined with most insecticides at 1 : 1600 by weight, it gives satisfactory wetting and spreading. Added to cubé sprays, it improved control of *Epitrix cucumeris*, Harr., on potato, and *Thrips tabaci*, Lind., on onion, and somewhat improved that of *Macrosiphum onobrychis*, Boy. (*Illinoia pisi*, Kalt.) on peas, and *P. nubilalis* on potato and sweet maize. At 1 : 1000 it increased the effectiveness of a derris dust against *E. cucumeris* on potato. At 1 : 1600 it also increased the control of *P. nubilalis* on potato by sprays of calcium arsenate with Bordeaux mixture, but not by Paris green with Bordeaux mixture. Against *Epilachna varivestis*, Muls., on beans, *Diabrotica melanocephala*, F., (*vittata*, F.) on cucurbits, and *Pieris rapae*, L., and *Plusia* (*Autographa*) *brassicae*, Riley, on cabbage, it did not increase the control effected by cubé sprays and dusts, which was adequate without it.

OSBURN (M. R.). **Termites infesting Turnips.**—*J. econ. Ent.* **30** no. 6 p. 967. Menasha, Wis., December 1937.

In May 1937, a colony of *Reticulitermes flavipes*, Kollar, was observed to be attacking the roots of turnips in a garden in Florida. Practically all the infested turnips were near a garage, the wood of which was in contact with the soil. The older roots were most heavily infested, one containing 155 live worker and soldier termites.

DONOHOE (H. C.) & KALOOSTIAN (G. H.). **Notes on the Grape Leaf Folder and its Parasites in the San Joaquin Valley.**—*J. econ. Ent.* **30** no. 6 pp. 967–968, 1 ref. Menasha, Wis., December 1937.

Desmia funeralis, Hb., caused extensive damage to grape-vines in California [*cf. R.A.E.*, A **22** 649] in the autumn of 1936, particularly to one late-maturing variety in the central region. In many cases, complete destruction of the foliage was followed by feeding on the berries, whole crops sometimes being rendered unfit for sale as fresh fruit. Parasitism of the full-grown larvae by *Microbracon cushmani*, Mues., was common in three widely separated infestations and approached 100 per cent. by 15th October. The average number of immature parasites per host larva was 8·3. Parasitism by this Braconid was reduced in vineyards dusted with calcium cyanide in August and September for the control of *Erythroneura comes*, Say. Severe damage to fruit was noticed only in vineyards so dusted. Five species of parasites were reared from pupae collected during the autumn and winter of 1936–37, *viz.*, *Brachymeria ovata*, Say, *Pimpla* (*Ephialtes*) *sanguinipes*, Cress., *Anachaetopsis tortricis*, Coq., *Zenillia ceratomiae*, Coq., and *Nemorilla floralis maculosa*, Mg. The maximum parasitism obtained was 50·7 per cent. There is evidence that each species parasitises the larva, persists during the metamorphosis of the host and emerges from the pupa. Oviposition in the pupa was not observed. *P. sanguinipes* and *N. f. maculosa* overwinter in the host pupae.

Dozier (H. L.). **Sodium Lauryl Sulfate as a Contact Spray.**—*J. econ. Ent.* **30** no. 6 p. 968. Menasha, Wis., December 1937.

A single application of a sulphated fatty alcohol at the rate of 2 fl. oz. per U.S. gal. water completely cleared a very heavy infestation of *Macrosiphum* (*Illinoia*) *solanifolii*, Ashm., and *Myzus persicae*, Sulz., on sweet potato plants in a greenhouse in Louisiana in May 1937, and gave excellent kill of the common greenhouse red spider [*Tetranychus telarius*, L.] on foliage of sweet potato and dahlia and of the red spider on *Citrus* [*Paratetranychus citri*, McG.]. Sprayed into open blooms, it killed the flower thrips [*Frankliniella tritici*, Fitch] without causing scorching or staining. Greenhouse ants and mosquitos were also killed immediately. Out of doors, a single application gave a good kill of *Eriococcus azaleae*, Comst., on azalea and of the citrus whitefly, *Dialeurodes citri*, R. & H., without causing apparent injury.

Dozier (H. L.). **Sweet Potato Root Weevil overwinters as Adult in Louisiana.**—*J. econ. Ent.* **30** no. 6 p. 968. Menasha, Wis., December 1937.

Of 500 active adults of *Cylas formicarius*, F., placed in each of two screened ground cages sunk in typical headland and ditch bank in Louisiana on 25th November 1936, the majority disappeared during a cold spell on 8th December, but a good percentage reappeared the next morning and fed on sweet potatoes. On 24th December, fresh sweet potatoes were placed in the cages, and the old ones were removed and kept indoors, where large numbers of weevils developed from them. All sweet potatoes were removed from the cages on 10th January 1937, leaving only the natural vegetation as available food. Adults were observed in the cages on 8th April, but in diminished numbers, and none appeared to feed on sweet potatoes introduced on 20th April.

Davis (A. C.). *Tyroglyphus longior* **Gerv. on cultivated Mushrooms.**—*J. econ. Ent.* **30** no. 6 pp. 968–969, 2 refs. Menasha, Wis., December 1937.

All mites of the genus *Tyroglyphus* [*sens. lat.*] found attacking cultivated mushrooms in the United States have in the past been referred to *T. lintneri*, Osb., a species described from mushrooms in New York. However, all individuals taken by the author on cultivated mushrooms, including series from Washington, Illinois and Pennsylvania, proved to belong to a species apparently identical with *Tyrophagus putrescentiae*, Schr. (*Tyroglyphus longior*, Gerv.).

WOOD (M.) & WORTHLEY (H. N.). **Rose Leaf Beetle in Pennsylvania.**—*J. econ. Ent.* **30** no. 6 pp. 969–970, 3 refs. Menasha, Wis., December 1937.

Of recent years, injury to apple fruits by adults of *Nodonota puncticollis*, Say, has increased in importance in Pennsylvania. Larvae suspected to be those of this Eumolpid were found on roots of sweet clover [*Melilotus*] in the summer of 1936, and two adults were recovered from cages placed over these plants in the spring of 1937. Digging in May 1937 revealed pupae in cells 1 in. or less below the surface of the soil among the roots of red clover [*Trifolium pratense*], sweet clover and pasture thistle in apple orchards, but not under a number of other weeds in the orchard. In 1937, the beetles emerged from the ground from 28th May to 7th June, were observed to pair from 5th June to 16th July, and were scarce by 20th July. They first fed on the corollas of red clover, alsike clover [*T. hybridum*] and wild rose and the leaves of pasture thistle. Fruits of apple were attacked from 6th to 22nd June. After apple, they fed on various plants, including the leaves of peach and plum. In one orchard, a block of apples sprayed twice during the attack in 1936 with a spray of 2 lb. lead arsenate per 100 U.S. gals. at the rate of 4 U.S. gals. per tree had 23 per cent. injured fruits. In 1937, 4 applications of a spray of 3 lb. lead arsenate per 100 U.S. gals. at the rate of 8·5 U.S. gals. per tree reduced injured fruit to 0·4 per cent., and 4 applications of a spray of 2·5 lb. lead arsenate per 100 U.S. gals. at 5–6 U.S. gals. reduced it to 2·2 per cent. The sprays seemed to act chiefly as repellents.

FLANDERS (S. E.). **Starvation of developing Parasites as an Explanation of Immunity.**—*J. econ. Ent.* **30** no. 6 pp. 970–971, 3 refs. Menasha, Wis., December 1937.

It is suggested that certain hosts may be unsuitable for the complete development of certain parasites because they are inadequate as food. In such a host, the parasite succumbs when it is in a stage of rapid growth. When unfertilised, as well as fertilised, eggs of *Coccophagus gurneyi*, Comp., are deposited in a single individual of an immune host such as *Pseudococcus citri*, Risso [*cf. R.A.E.*, A **25** 771], embryonic development is completed in about 3 days. The fertilised (female) eggs hatch, but the larvae soon die, the unfertilised (male) eggs do not hatch as long as they are surrounded by the body fluids of the mealybug [*cf.* **24** 547], but the larvae in them remain alive for long periods. It is improbable that a defensive reaction would affect only the female larvae. *P. citri* is unsuitable for the development of both sexes. The death of the female is probably brought about by starvation, while the male is able to survive because it is adapted to exist for long periods with little or no food. The degree of immunity of various hosts to the progeny of a parasite appears to be correlated only with their physiological composition and not with their phylogenetic relationship.

STEINER (H. M.) & CHAPMAN (P. J.). **Food Plants of** *Nodonota puncticollis* **Say.**—*J. econ. Ent.* **30** no. 6 pp. 971–972. Menasha, Wis., December 1937.

During a survey of the food-plants of *Nodonota puncticollis*, Say, in eastern New York, larvae and pupae were found among the roots of

Trifolium agrarium, Potentilla canadensis, Hieracium pratense and *H. aurantiacum* in the spring of 1937. An average of 5·3 adults per sq. ft. emerged in a cage over 76 sq. ft. of land bearing the first three during 1937. Unpigmented adults, pupae and full-grown larvae were found in the soil on 27th May and the last larvae on 19th June. In 1936, the beetles first appeared on plants on 25th May. During 1937, emergence occurred from 1st to 25th June with a peak from 5th to 10th. Adults were observed to feed first on dogwood (*Cornus* spp.) near the food-plants of the larvae, and later on a variety of plants. Feeding was most extensive during the second and third weeks of June and was not observed in orchards after 4th July in 1937. The last adults were seen on dogwood on 20th July. Severe injury was caused to the fruits and slight injury to the leaves of apple, pear and peach, and adults were also observed to feed on the flowers, fruit or foliage of 11 other plants, including raspberry, blackberry and strawberry. The plants injured by the adults were nearly always close to some of the 4 plants that harbour the larvae.

Blanton (F. S.). **Leafhoppers and Homoptera of related Families collected in and adjacent to Narcissus Plantings.**—*J. econ. Ent.* **30** no. 6 p. 972. Menasha, Wis., December 1937.

During an investigation of the insect fauna of narcissus in the United States, the plants were observed to be attacked by the Jassids, *Aceratagallia sanguinolenta*, Prov., *Agallia constricta*, Van D., *Chlorotettix unicolor*, Fitch, *C. viridius*, Van D., *Macrosteles* (*Cicadula*) *divisa*, Uhl., *Draeculacephala mollipes*, Say, *Empoasca erigeron*, DeLong, *E. fabae*, Harr., *Polyamia inimica*, Say, *Thamnotettix nigrifrons*, Forbes, *Phlepsius irroratus*, Say, *Platymetopius acutus*, Say, *P. frontalis*, Van D., and *Graphocephala coccinea*, Forst., the Cercopids, *Aphrophora quadrinotata*, Say, *Philaenus leucophthalmus*, L., and *P. lineatus*, L., the Membracid, *Stictocephala festina*, Say, the Delphacid, *Stobaera tricarinata*, Say, and the Psyllid, *Aphalara calthae*, L. No species seemed to prefer narcissus to its native food-plant. In cage tests, *Aceratagallia sanguinolenta*, *Agallia constricta*, *M. divisa*, *D. mollipes* and *E. erigeron* lived on narcissus for 10 to 15 days. *G. coccinea* lived only a short time. There was no positive evidence that any of the species was a vector of the virus causing narcissus mosaic.

Oman (P. W.). **New Eupterygine Leafhoppers from Puerto Rico (Homoptera-Cicadellidae).**—*J. Agric. Univ. P. R.* **21** no. 4 pp. 567–571, 1 pl. Río Piedras, P.R., November 1937.

Descriptions are given of five new species of Jassids from Porto Rico, two of which are of economic importance. These are *Dikraneura cedrelae*, taken on *Cedrela odorata*, and *Empoasca papayae*, taken on papaya (*Carica papaya*) and stated to be associated with the " bunchy-top disease " of this plant.

Wolcott (G. N.) & Martorell (L. F.). **The Ant, *Monomorium carbonarium ebeninum* Forel, in a new Role : as Predator on the Egg-clusters of *Diatraea saccharalis* F. in Puerto Rican Cane Fields.**—*J. Agric. Univ. P. R.* **21** no. 4 pp. 577–579, 1 ref. Río Piedras, P.R., November 1937.

Some or all of the eggs in one-sixth of nearly 9,000 egg-clusters of *Diatraea saccharalis*, F., collected in the cane fields of Porto Rico between September 1936 and September 1937 were found to have been destroyed by a predator. Parasitised and unparasitised eggs and those from which larvae had hatched or parasites emerged were all attacked, and there appeared to be little difference in the proportion of egg-clusters damaged in the different cane-producing areas of the island. Cage experiments with the Coccinellid, *Cycloneda sanguinea*, L., which is an important predator of *Sipha flava*, Forbes, and the Lycid, *Thonalmus chevrolati*, Bourgeois, which is also common in the cane fields, showed that neither would accept eggs of *D. saccharalis* ; nor were they observed feeding on them in the field. The small black ant, *Monomorium carbonarium* subsp. *ebeninum*, Forel, was repeatedly observed feeding on fresh, parasitised and hatched egg-clusters in the field, and was probably responsible for most, if not all, of the destruction. It is common in all parts of Porto Rico and occurs in localities other than cane fields. It has been observed attending *S. flava*, but, except for *Trichogramma minutum*, Riley, it is the only natural enemy of *D. saccharalis* on the island.

López Cristóbal (U.). **Los " pulgones verdes " de los cereales y sus parásitos.** [The Green Aphids of Cereals and their Parasites.]—*Bol. Lab. Zool. agríc. Fac. Agron. La Plata* no. 3 pp. 1–5 multigraph, 2 pp. refs. La Plata, 20th December 1937.

Toxoptera graminum, Rond., has now been found on wheat, *Sorghum*, oats and barley in various parts of Argentina [*cf. R.A.E.*, A **25** 631 ; **26** 30], and it is estimated that over 12,000 acres of cereals in the provinces of Santa Fé and Entre Rios have been destroyed by it. The only forms observed were alate and apterous viviparous females that reproduced parthenogenetically. Two other Aphids associated with it on cereals in Argentina, which were recorded as *Macrosiphum avenae*, F. (*granarium*, Kby.) and *Rhopalosiphum prunifoliae*, Fitch (*Siphocoryne avenae*, auct.) [**26** 30], have been identified as *Macrosiphum* sp. (close to *solanifolii*, Ashm.) and *Aphis* (*R.*) *maidis*, Fitch. Laboratory and field investigations showed that these three Aphids do not usually attack maize or flax, but in one instance flax plants close to severely infested wheat were attacked and killed by *T. graminum.*

Aphidius platensis, Brèthes, is an effective parasite, but control by it is limited by the fact that its development in winter takes twice as long as that of *T. graminum*, by the scarcity of the latter in spring and autumn, which leads to multiple parasitism, and by the Braconid being itself parasitised in the Santa Fé region by a Cynipid, *Charips* (*Xystus*) *grioti*, de Santis [described in the fourth paper of this series]. The Coccinellid, *Eriopis connexa*, Germ., and larvae of the Syrphid, *Allograpta exotica*, Wied., are both predacious on *Toxoptera*, but are parasitised by the Encyrtid, *Lepidaphycus bosqi*, Blanchard, and the Ichneumonid, *Bassus* (*Diplazon*) *laetatorius*, F., respectively.

Griot (M.). **Etologia de la** *Toxoptera graminum* **Rondani.**—*Bol. Lab. Zool. agríc. Fac. Agron. La Plata* no. 3 pp. 6–9 multigraph, 1 graph. La Plata, 20th December 1937.

Details are given of the infestation by *Toxoptera graminum*, Rond., of experimental plots of wheat and oats in Santa Fé, Argentina. Material was also received from other parts of the country and from

Uruguay. In order of decreasing importance, the preferred food-plants of the Aphid were wheat, oats, barley, wild grasses, *Phalaris* and *Sorghum*. It could live for some time on maize, although this is not a favourable food-plant, but survived only a few days on flax. In a field cage it lived 1–80 days, with an average of 55. Natural enemies [see preceding abstract] included an unidentified Cecidomyiid. Various insecticides were tested, the best being an emulsion of kerosene and potash seal-oil soap.

López Mansilla (E. E.). **Etologia del *Aphidius platensis* Brèthes.**—*Bol. Lab. Zool. agríc. Fac. Agron. La Plata* no. 3 pp. 10–13 multigraph, 1 graph, 6 refs. La Plata, 20th December 1937.

The results are given of investigations in Argentina on the bionomics of the Braconid, *Aphidius platensis*, Brèthes, parasitising *Toxoptera graminum*, Rond., on wheat. The egg and larva and the processes of oviposition and development of the immature stages are described. The Braconid was not specific to *T. graminum*, as in the laboratory it also parasitised *Aphis gossypii*, Glov., and *Anuraphis schwartzi*, Börner (*persicae*, Boy.) without the occurrence of specialised strains. Both alate and apterous females and nymphs of *T. graminum* were parasitised. Multiple parasitism resulted in the death of the parasites and their host, and it is concluded that only one Braconid larva can develop in one host. At 18–20°C. [64·4–68°F.] the egg, larval and pupal stages lasted 4, 6 and 3 days, and complete development required 8 and 39 days at 27–28 and 7–15°C. [80·6–82·4 and 44·6–59°F.], respectively. The parasite pupates in the dead host. One unmated female, placed with 200 Aphids, gave rise to 53 offspring.

de Santis (L.). **El hiperparasito del pulgon verde de los cereales** [The Hyperparasite of the Green Aphis of Cereals.]—*Bol. Lab. Zool. agríc. Fac. Agron. La Plata* no. 3 pp. 14–16 multigraph. La Plata, 20th December 1937.

A description is given of the adults of both sexes of the Cynipid, *Charips* (*Charips*) *grioti*, sp. n., parasitising the Braconid, *Aphidius platensis*, Brèthes, in Argentina and Uruguay. In a foot-note, U. López Cristobal points out that the generic name *Xystus*, under which this parasite was previously recorded [*R.A.E.*, A **26** 31], is preoccupied and must be replaced by *Charips*.

Boerger (A.). **Erfahrungen in der Bekampfung des Kartoffelschädlings *Epicauta*.** [Experience in the Control of *Epicauta* on Potato.]—*Tropenpflanzer* **41** no. 1 pp. 1–13, 5 figs. Berlin, January 1938.

In the La Plata region of Argentina, Uruguay and southern Brazil, the most important pests of potato are *Epicauta adspersa*, Klug, *E. aterrima*, Klug, and *E. atomaria*, Germ. The adults attack the plants suddenly, even large areas being rapidly defoliated. They appear at the beginning of the hot season, and after mating, usually in midsummer, the females deposit their eggs in the soil. The larvae, which hatch in 3 weeks, feed mainly on the eggs of locusts, and complete their development after hibernating. Besides potato, other Solanaceae, particularly tomato, are attacked, as well as Chenopodiaceae and Cruciferae. In the areas in which these beetles occur, there are two potato crops a year, which should be planted at dates designed to avoid the midsummer peak of infestation. Other measures are, however, necessary, and threatened fields are protected by a spray of 1½ lb. Paris green and 3–7½ lb. lime in 100 gals. water. The preparation and transport of quantities of liquid insecticide are, however, troublesome when labour is scarce in summer. The author found a proprietary German dust insecticide containing arsenic and some copper salt to be very effective. It was applied with a knapsack duster, and an account of the work is given.

BESSE (R. S.). **Effect of agricultural and home Economics Research on Oregon's agricultural Progress. A Report of Activities and Accomplishments for Biennium ending June 30, 1936.**—*Bull. Ore. agric. Exp. Sta.* no. 350, 88 pp., 28 figs., Corvallis, Ore., June 1937. [Recd. February 1938.]

The pests dealt with in the section on entomology (pp. 40–46) include *Taeniothrips inconsequens*, Uzel, for the control of which on prunes combinations of nicotine with lime-sulphur, fish-oil soap and miscible oil were of value in the order given ; the strawberry crown moth [*Aegeria bibionipennis*, Boisd.], which was more effectively controlled by topping the plants and covering them with soil before the beginning of the main flight of moths than by topping alone ; *Capitophorus fragaefolii*, Ckll., a vector of certain virus diseases of strawberries, which is present in all parts of the state where its food-plants (cultivated and wild strawberry, cultivated and wild rose and two species of *Potentilla*) are available ; *Diabrotica soror*, Lec., of which females with fully developed egg sacs were found in September, though information obtained before 1935 indicated that there was only one generation a year, and against which derris dust was of value ; the pea aphis [*Macrosiphum onobrychis*, Boy.], which was more injurious than for a number of years and against which rotenone-bearing sprays gave the best control [*cf. R.A.E.*, A **25** 561, etc.] ; and the pea Bruchid [*Bruchus pisorum*, L.], which it was found possible to control with rotenone-bearing dusts. In 1935, the infestation of apples by the first brood of *Cydia* (*Carpocapsa*) *pomonella*, L., was unusually light, probably on account of the low evening temperatures. *Ascogaster carpocapsae*, Vier., which was liberated against it in 1934, appears to have become established. Since 1930, birds have become increasingly important in the control of *C. pomonella*, the larvae of which they have learned successively to remove from corrugated cardboard, burlap and chemically treated bands. As a result of experiments, calcium arsenate is being recommended in place of lead arsenate for sprays against *C. pomonella*.

SWAIN (R. B.), GREEN (W.) & PORTMAN (R.). **Notes on Oviposition and Sex Ratio in *Hyposoter pilosulus* Prov. (Hym. : Ichneumonidae).**—*J. Kans. ent. Soc.* **11** no. 1 pp. 7–9, 1 ref. McPherson, Kans., January 1938.

Hyposoter pilosulus, Prov., an Ichneumonid parasite of *Hyphantria cunea*, Dru., was easily reared in the laboratory during experiments in Colorado in 1935. Host larvae in all instars from the second to the last (eighth) were attractive to the female parasites for oviposition, but it is improbable that parasites ever emerge from larvae parasitised in the last instar. Parthenogenesis produced males. Paired females produced male and female offspring in approximately equal numbers. Females may live considerably more than two weeks in the laboratory and lay as many as 47 eggs in a day.

WALKDEN (H. H.) & BRYSON (H. R.). **Notes on an interesting Food Habit of False Wireworm Adults.**—*J. Kans. ent. Soc.* **11** no. 1 pp. 10–13, 10 refs. McPherson, Kans., January 1938.

Information on the feeding habits of adults of the Tenebrionids known as false wireworms (chiefly species of *Eleodes*) in the United States is reviewed from the literature, and an account is given of a phenomenon hitherto apparently unrecorded. In the late afternoon on a warm sunny day in September 1936, large numbers of false wireworm adults were found congregated on the mounds of *Pogonomyrmex occidentalis*, Cress., in a field of wheat stubble in Kansas [*cf. R.A.E.*, A **6** 494]. They were devouring seeds dropped by the ants. Occasionally, they burrowed into the galleries, but it was not determined whether they could penetrate sufficiently to reach the stored seed. Ants returning to the nest with a seed were often set upon by the beetles. Similar observations were made in a different part of the state in October. Identification of beetles collected from both districts showed that the species present were *Eleodes obsoleta*, Say, *E. opaca*, Say, *E. suturalis*, Say, *E. tricostata*, Say, and *Eusattus difficilis*, Lec.

BRIDWELL (J. C.). *Specularius erythrinae*, **a new Bruchid affecting seeds of** *Erythrina* (**Coleoptera**).—*J. Wash. Acad. Sci.* **28** no. 2 pp. 69–76, 1 ref. Menasha, Wis., February 1938.

Descriptions are given of both sexes of the Bruchid, *Specularius erythrinae*, gen. et sp. n., which was taken in seeds of *Erythrina tomentosa* from Tanganyika Territory in 1925. It was subsequently recorded from other species of *Erythrina* in South Africa, Goa, Salsette Island, near Bombay, and Pulu We Island, Sumatra.

DONOHOE (H. C.). **Nests of Leaf-cutting Bees in dried Figs.**—*Proc. ent. Soc. Wash.* **40** no. 1 pp. 15–16. Washington, D.C., January 1938.

During the autumn of 1935, leaf-cutting bees infested figs in California. The bees construct cylindrical cases in the fig with leaf segments carried in through the eye, store a provision of pollen in the cases and seal them with more leaf segments. An examination on 1st and 3rd October of an area from which infested figs had come showed that the leaves used were predominantly or entirely those of a species of *Polygonum*. No bees were found cutting segments or entering figs, but on 3rd October, two species of Megachilids were found in some numbers along the banks of ditches frequenting flowers of *Stachys albens*. One was identified as *Anthidium maculosum*, Cresson, and pollen from the pollen basket of one individual appeared to be identical with one of the many types found in the cases. Figs for drying are allowed to fall and are harvested periodically from the ground. It is not known whether they become infested on the trees or on the ground. As many as three cases were found in a single fig. G. H. Kaloostian discovered two figs containing nests formed of a mass of plant fibres surrounding a tubular chamber, which opened through the eye of the fig. These were thought to be the work of *A. maculosum.* They appeared to be constructed of fibres from the hairy covering of leaves, stems and flowers of *Stachys albens.*

ROSS (H. H.). **The Nearctic Species of *Pikonema*, a Genus of Spruce Sawflies (Hymenoptera, Tenthredinidae).**—*Proc. ent. Soc. Wash.* **40** no. 1 pp. 17–20, 1 fig. Washington, D.C., January 1938.

In a recent paper [*R.A.E.*, A **25** 901], the author erected the genus *Pikonema* for a group of closely allied sawflies. As a result of further study, he concludes that it comprises 3 species : *Pikonema* (*Nematus*) *dimmocki*, Cress. (the type) and *P.* (*Pachynematus*) *alaskensis*, Rohw., both of which occur on spruce (*Picea* spp.) in various parts of Canada and the United States, and *P.* (*N.*) *ruralis*, Cress., which occurs in Oregon, but of which only the adult female is known. He considers that *Pachynematus ocreatus*, Harr., and *P. piceae*, Rohw., are synonyms of *dimmocki* and *alaskensis*, respectively. The characters of the genus and species are described, with a key to the latter, and records are given of the distribution of *dimmocki* and *alaskensis* and of the species of spruce on which they have been found.

DOWNES (W.). **Two interesting Records of Lepidoptera from Vancouver Island.**—*Canad. Ent.* **70** no. 1 pp. 19–20. Orillia, January 1938.

In August 1937, larvae of *Heliothis phloxiphaga*, Grote & Rob., were responsible for serious damage on seed farms on Vancouver Island. The principal injury was caused by the larvae eating into the seed-capsules of *Antirrhinum* and destroying the unripe seeds ; the flower-heads were also damaged, about 70 per cent. of the plants being injured. Other plants attacked were *Schizanthus*, aster and, to a slight extent, sweet pea. Larvae of *Hemerocampa pseudotsugata*, McDunn. (fir tussock moth) were found on Vancouver Island in 1936 and 1937. This species defoliated Douglas fir [*Pseudotsuga taxifolia*] in British Colombia in 1918 and 1920 [*cf. R.A.E.*, A **21** 69, etc.] and caused much discomfort on account of the poisonous hairs in the cocoons, which were frequently spun on walls or fences near dwellings.

Both these moths are recorded for the first time from Vancouver Island. They appear to be examples of a group of insects typical of the dry interior of the island, which cannot live on the wetter parts of the coast but are maintained on the strip of coast from Victoria northwards for 140 miles, where rainfall is light and dry periods are of considerable length.

DOWNES (W.). **The Occurrence of *Sitona lineatus* L. in British Columbia.**—*Canad. Ent.* **70** no. 1 p. 22. Orillia, January 1938.

Adults of *Sitona lineata*, L., caused serious injury to seedling peas in the extreme south of Vancouver Island in the summer of 1937 and were also found in numbers on red clover about 12 miles away. They had been taken under bands on fruit trees in the previous autumn. This is the first record of the weevil in North America. Brief notes are given from the literature on its food-plants in Europe and the damage it causes.

Ghosh (C. C.). **The Black Beetle** (*Alissonotum impressicolle* **Arr.), a Pest of Sugarcane in Myitkyina District in Northern Burma.**—*Indian J. agric. Sci.* **7** pt. 6 pp. 907–931, 2 pls., 5 figs., 3 refs. Delhi, December 1937.

Alissonotum impressicolle, Arr., is a serious pest of sugar-cane in a district about 300 miles north of Mandalay in northern Burma. Brief notes are given on the characters of soil and climate in the district ; the beetle has not so far been abundant where the soil is highly acid. It occurs in association with elephant grasses both in Assam and Burma (where the preponderant species are *Saccharum arundinaceum* and *Imperata arundinacea*, among the roots of which the larvae are common), but has also been found on high, well-drained lands without any elephant grass. It was first recorded as a pest of sugar-cane in Assam in 1919 and in Burma in 1927. S. Takano, in a communication to the author, stated that in Formosa it is a pest of sugar-cane in unirrigated districts in the south and causes most injury in May and June ; cane planted from January to April suffers severely but that planted from July to October is little affected. In northern Formosa, cane is an irrigated crop grown in rotation with rice, and most of the larvae die during the rainy season from December to March. Crops are rarely ratooned. *Campsomeris* (*Elis*) *annulata*, F., which also occurs in Burma, destroys about 1·5 per cent. of the larvae.

In Burma, eggs are laid in the soil from late September to early December and hatch in about 2–2½ weeks. Larvae are capable of feeding and developing on humus, but in sugar-cane fields they live among and feed on the roots, and so are not affected by the cultivation of the soil between the rows. They only become a pest when conditions are favourable for breeding in the field, as when ratooning is long continued. Pupation and adult emergence begin in early and mid-March, respectively. The adults are active until late June or early July, gnawing the shoots of cane, and then rest until late September, when oviposition begins. They are dead by December. If drought occurs while the beetles are active, feeding decreases, but is renewed with heavy showers of rain. When in want of food, they migrate in numbers. They are slightly repelled by strong lights. Collections at the beginning of the season showed that the sexes were about equal in number, but later females greatly outnumbered males. Females probably lay about 100 eggs, depositing them a few at a time and often at intervals of several days.

Details are given of the extent and nature of the damage caused by this Dynastid. In 1932, it was estimated that 12–75 larvae occurred under each root over large areas of ratoon cane. The variety of sugar-cane chiefly grown up to 1932 shows some slight resistance to attack, but ratoons well, third ratoon being commonly taken and sometimes fourth and fifth, which encourages the infestation. Four other varieties, which are less resistant but which can only be ratooned once, are now recommended. Natural enemies of the larvae, none of which appears to be of much importance, include various birds, the Asilid, *Philodicus femoralis*, Ric., *Campsomeris annulata*, a Tachinid parasite, several Carabid predators, and the fungus, *Metarrhizium anisopliae*.

An account is given of experiments on control in which various baits for the adults were ineffective, and soil fumigants against the larvae did not give results good enough to justify their use. Flooding the fields with water only killed a small percentage of the larvae. A rotary plough, working down to about 4 ins., destroyed 40 per cent. of the larvae and exposed others to birds. The only measure that has so far given any practical result is the restriction of ratooning and the introduction of a fallow period of at least a year. Infestation is negligible if cane is grown as an annual crop in rotation with non-cereal crops. The possibilities of control by hand collection of the beetles or by introducing natural enemies are discussed.

FRANSSEN (C. J. H.). **Levenswijze en bestrijding van den kruidnagel- en djamboe-boorder** (*Nothopeus hemipterus* **Oliv.**). [The Life-history and Control of *Coloborhombus hemipterus*, Ol.]—*Landbouw* **13** pp. 569–586, 2 figs., 8 refs. Buitenzorg, 1937. (With a Summary in English.)

Injury by Cerambycids to clove trees (*Eugenia aromatica*) has been reported repeatedly in the Netherlands Indies, the borers found being *Coloborhombus* (*Nothopeus*) *fasciatipennis*, Waterh., in Sumatra and Borneo [*R.A.E.*, A **23** 732], *C.* (*N.*) *hemipterus*, Ol., in Java and Sumatra, and *Hexamitodera semivelutina*, Heller, in North Celebes. In this paper are recorded the results of a study of *C. hemipterus*, all stages of which are described.

The eggs are laid separately in the bark of the trunk, as a rule not more than about 6 ft. above the ground. The larvae tunnel in the wood, mostly in the basal part of the trunk, rarely boring immediately beneath the bark. Heavily infested trees may die. When full-fed, the larva gnaws an exit hole and then pupates in a cell in the mine, which it closes by a plug of wood fragments. At Buitenzorg, the egg, larval, prepupal and pupal stages averaged 15, 248, 20 and 23 days, respectively, and the adults remained in the pupal cells for about 22 days. In the laboratory, females lived for about 16 days after emerging from the mines and laid from 14 to 90 eggs, the average being 40. The food-plants found in Java were *E. aromatica*, *E. malaccensis*, *E. aquea*, *E. polyantha*, *E. cumini*, *Lagerstroemia speciosa* and *Tristania* ? *conferta*. Unsatisfactory results were obtained in attempts to destroy the larvae in their mines by injecting carbon bisulphide, benzene, or paradichlorobenzene in kerosene. The sealing of all holes made by the larvae with plugs of clay or pieces of bamboo is recommended, supplemented where only a few trees are grown by collection of the eggs.

BROWNE (F. G.). **Biological Notes on Malayan Scolytoidea.**—*Malay. Forester* **7** no. 1 pp. 23–30, 3 refs. Kuala Lumpur, January 1938.

In this part of a series [*cf. R.A.E.*, A **25** 119], brief notes are given on the food-plants, habits, gallery systems, etc., of 18 Scolytids and 5 Platypids occurring in the Malay Peninsula. The species include 13 ambrosia beetles, 8 bark-beetles and 2 boring in fruit.

CUSHMAN (R. A.). **New Japanese Ichneumonidae parasitic on Pine Sawflies.**—*Insecta Matsum.* **12** no. 1 pp. 32–38, 4 refs. Sapporo, Japan, November 1937.

Both sexes are described of the following new parasites from Japan: *Microcryptus* (*Pezoporus*) *annulaticrus*, from cocoons of *Diprion* *nipponicum*, Rohw, and *D.* (*Neodiprion*) *sertifer*, Geoffr.; *M.* (*P.*) *opacus*, *Delomerista japonica* and *Lamachus albopictus*, from cocoons of *Diprion nipponicum*; and *Lophyroplectus nipponensis*, from cocoons of *D. sertifer*.

WATANABE (C.). **On some Species of Braconidae from Manchoukuo (Contribution to the Knowledge of the Braconid Fauna of Manchoukuo, I).**—*Insecta Matsum.* **12** no. 1 pp. 39–44. Sapporo, Japan, November 1937.

The nine species recorded include *Apanteles ruficrus*, Hal., *A. kariyai*, sp. n. (both sexes of which are described) and *Meteorus scutellator*, Nees, all from *Cirphis unipuncta*, Haw.; *Macrocentrus japonicus*, Watanabe, from *Pyrausta diniasalis*, Wlk.; and *M. gifuensis*, Ashm., from *P. nubilalis*, Hb.

ISHII (T.). **Descriptions of six new Species belonging to the Aphelinae from Japan.**—*Kontyû* **12** no. 1 pp. 27–32. Tokyo, January 1938.

The six new Aphelinids, all of which are described from females, are: *Aspidiotiphagus pseudoaonidiae* from *Pseudaonidia* sp. on *Ficus retusa* var. *nitida* and *P. duplex*, Ckll., on *Citrus*; *Prospaltella thoracaphis* from *Nipponaphis* (*Thoracaphis*) *takahashii*, Strand, on *Quercus glauca*; *P. citri* from *Dialeurodes citri*, R. & H.; *P. bemisiae* from *Bemisia myricae*, Kuwana; *Eretmocerus aleurolobi* from *Aleurolobus marlatti*, Quaint.; and *Physcus bifasciatus*, of which one female was collected by sweeping.

WARBURTON (C.). **Annual Report for 1937 of the Zoologist.**—*J. R. agric. Soc. Engl.* **98** pp. 560–564. London, 1937.

Most of the insect pests recorded in England and Wales in 1937 were species of common occurrence. Butterflies reared from caterpillars infesting raspberries proved to be *Lycaenopsis* (*Lycaena*) *argiolus*, L. Beech trees in one locality were severely attacked by *Phyllaphis fagi*, L., and juniper in another by *Dichomeris marginella*, F. In October, bell heather [*Erica*] was injured by *Eriococcus devoniensis*, Green, which deposited many egg-sacs on the plants; burning over the heather was suggested as a control measure.

JARY (S. G.) & AUSTIN (M. D.). **Department of Entomology** [Report 1936–37].—*J. S.-E. agric. Coll.* no. 41 pp. 9–14, 11 refs. Wye, Kent, January 1938.

Brief notes are given on the insect pests observed in south-eastern England in the year ending September 1937, chiefly the species that commonly occur there on orchard and field crops [*cf. R.A.E.*, A **25** 337, etc.]. The most serious injury to cereals was caused by *Tipula* spp., but *Chlorops taeniopus*, Mg., was more abundant than usual on barley, possibly because it was sown late. Sugar-beet and mangels were heavily infested by *Aphis rumicis*, L., in some fields, and mangels on land ploughed from old pasture in 1936 were injured by *Amphimallus solstitialis*, L. *Meligethes aeneus*, F., completely destroyed seed crops of a variety of kale without causing much injury to seed crops of swedes. Carrots were heavily infested by *Cavariella* spp., and foliage of parsnips in one district was damaged by *Depressaria heracleana*, L. *Lygus pabulinus*, L., was particularly abundant on bush fruits, including blackberries and loganberries as well as currants, and it sometimes migrated to apple, causing much injury to the wood growth of young trees. Loganberries were also attacked by *Incurvaria* (*Lampronia*) *rubiella*, Bjerk. *Rhynchites aequatus*, L., caused a good deal of marking on fruits of apple, and *R. coeruleus* was injurious on young trees, but both can be controlled by derris dusts or sprays. Apples of one variety were damaged by larvae of the dock sawfly, *Ametastegia glabrata*, Fall.

Infestation of mushrooms by Sciarid and Phorid flies appears to have been less serious than for the past few years. Several instances occurred of damage due to mites, especially *Tyrophagus putrescentiae*, Schr. (*Tyroglyphus dimidiatus*, Herm.), and the variety *castellanii*, Hirst, previously only known in copra fibre, was reported [**25** 707].

Considerable injury was caused to chrysanthemums by *Longitarsus succineus*, Foudr. (*laevis*, Allard) and *Otiorrhynchus ligneus*, Ol., which attacked the foliage, *Myzus ornatus*, Laing, which damaged the blooms, and *Rhopalosiphum rufomaculatum*, Wils. (*lahorensis*, Das), and to roses by *Otiorrhynchus clavipes*, Bonsd. (*tenebricosus*, auct.), which stripped many flowering shoots, and *Thomasiniana oculiperda*, Rübs.

STEER (W.). **Laboratory Methods for the Biological Testing of Insecticides. I. Methods of Testing Ovicides.**—*J. Pomol.* **15** no. 4 pp. 338–355, 2 pls., 7 refs. London, January 1938.

Detailed descriptions are given of standardised methods of conducting biological tests of ovicides. The eggs used are those of *Orgyia antiqua*, L., *Operophtera brumata*, L., *Aphis pomi*, DeG., and to a less extent, *Paratetranychus pilosus*, C. & F. (*Oligonychus ulmi*, auct.). *Orgyia antiqua* is a very useful test insect, as it can be reared in the insectary by a standardised method, which is described. Both eggs and larvae are used for insecticide tests, and the periods during which they are available are considerable, as the hatching of the eggs can be delayed or accelerated by appropriate temperatures. Eggs of *Operophtera brumata* are obtained from moths collected on fruit trees in neglected orchards ; shoots infested with eggs of *A. pomi* are obtained from apple rootstock stool-beds ; and apple or plum shoots infested with winter eggs of *P. pilosus* are obtained directly from orchards. The last-named is of value as an example of a pest susceptible to petroleum oil but unaffected by tar-oil sprays, but it gave unsatisfactory results in the laboratory, owing to the difficulty of counting the mites and of distinguishing between year-old egg shells and those from which mites have just hatched.

GRAY (R. A. H.) & BROOKS (H. E.). **Spraying Trials against Red Spider Mite** (*Oligonychus ulmi*) **on Damsons in Westmorland.**—*J. R. hort. Soc.* **63** pt. 2 pp. 77–80, 2 pls. London, February 1938.

In 1936, trials were made in Westmorland of the comparative merits of winter and summer spraying for the control of *Paratetranychus pilosus*, C. & F. (*Oligonychus ulmi*, auct.) on damson. The summer washes, which were applied in good weather on 18th June, gave better results than the winter sprays. Lime-sulphur with a spreader (1 per cent.), a petroleum wash (2 per cent.) and a refined white oil emulsion (2 per cent.) all gave good control, a colloidal sulphur (1 lb. to 20 gals. water) alone being unsatisfactory. Of the five winter washes tested, a 10 per cent. emulsion of tar oil and petroleum oil gave good control and can be recommended where pressure of work in summer renders winter spraying necessary. There is a danger of sprayed trees becoming partially re-infested with *P. pilosus* if unsprayed ones are near, the mites presumably being caused to drift by the prevailing wind.

WRIGHT (D. W.). **The Control of the Onion Fly.**—*J. Minist. Agric.* **44** no. 11 pp. 1081–1087, 1 pl., 5 refs. London, February 1938.

A brief survey is given of the bionomics of *Hylemyia antiqua*, Mg., on onions [*R.A.E.*, A **11** 67, 71] and the measures used for its control in various countries. In eastern England, the adults from overwintered puparia emerged from early May to mid-June, the peak period being the last two weeks of May; first-generation adults appear at the beginning of July and are most abundant in the middle of the month. From this time, adults can be found continuously until mid-September, but a third period of peak emergence in the latter half of August indicates the occurrence of another partial generation. The site of egg deposition and the feeding habits of the larvae are described; migration of older larvae to fresh plants is a feature of attack on seedling onions. Experiments were carried out in 1936 and 1937 to estimate the value of certain deterrents and poisons under local conditions. In 1936, a solution of corrosive sublimate [mercury bichloride] and a chlorcresylic acid dust, both applied 3 times at 10-day intervals, gave only slight control, and oil emulsion in Bordeaux mixture controlled *H. antiqua*, but injured the plants as much as did the larvae in the untreated plot. Dusting the seed with calomel [mercurous chloride] gave the best control, and was much more satisfactory than applying calomel along the drills as a 4 per cent. dust [*cf.* **17** 447; **22** 391]. In 1937, tests were made with the same treatments and seed treatments with lead arsenate and organic mercury compounds. The seed was sown on 22nd April. Only the calomel dust gave appreciable control. On 8th July, 91·5 per cent. of the original plants remained on the plot planted with seeds treated with calomel and 37 per cent. in the control plot. The seeds were damped with a solution of a proprietary adhesive paste containing starch and then shaken in a vessel with finely-powdered calomel, so that 1 lb. seed retained an equal weight of calomel. Organic mercury compounds did not control the maggots, and impaired germination, and lead arsenate was of no value. In July, comparative tests were carried out in which calomel was used at rates of ½ and 1 lb. per lb. seed. In September, plots planted with such seed had respectively 129 and 213 per cent. as many plants as the control. It is stated in a foot-note that a paste of starch or flour (3 teaspoonfuls in ½ pint water) is as effective as the proprietary adhesive paste.

MORLEY (A. M.). **More Ravages of Clothes Moths.**—*Entomologist* **71** no. 897 pp. 43–44. London, February 1938.

Larvae of the American clothes moth, *Borkhausenia* (*Acompsia*) *pseudospretella*, Staint., are recorded as destroying numbers of pupae of various Lepidoptera in breeding cages in a garage in the south of

England. The larvae were active throughout the year and particularly injurious in mid-summer and late autumn. It is thought that the moths could not have entered the cages and that they probably oviposited through the perforated zinc.

van Poeteren (N.). **Verslag over de werkzaamheden van den Plantenziektenkundigen Dienst in het jaar 1936.** [Report on the Work of the Phytopathological Service in 1936.]—*Versl. PlZiekt. Dienst Wageningen* no. 87, 84 pp., 4 pls. Wageningen, September 1937. [Recd. February 1938.]

Many of the pests recorded in Holland in 1936 have been noticed from previous reports [*R.A.E.*, A **25** 209; etc.]. *Trachea secalis*, L. (*Hadena didyma*, Esp.) was even more harmful to cereals than in 1935 [*loc. cit.*], *Hypera* (*Phytonomus*) *variabilis*, Hbst., occurred on lucerne, and larvae of *Tortrix* (*Cacoecia*) *rosana*, L., attacked cranberries, to which they migrated from wild myrtle. A derris dust containing 0·75 per cent. rotenone gave very good control of adults of *Oxytelus sculptus*, Grav., which attacked young cucumber fruits. This Staphylinid has not previously been record d as a pest and was apparently introduced into the cucumber frames with manure. Derris dusts proved effective against a number of other pests [*cf.* **26** 183], including *Meligethes aeneus*, F., on rape, and a dust of 1 part barium fluosilicate and 4 parts talc also gave good results against *Nygmia phaeorrhoea*, Don. (*Euproctis chrysorrhoea*, auct.) on oak and cherry.

Bovey (P.). **La teigne des pommes** (*Argyresthia conjugella* **Zell.**).—*Rev. hort. suisse* 1937 no. 4–5 repr. 8 pp., 11 figs., 3 refs. Geneva, 1937.

The main area of distribution of *Argyresthia conjugella*, Zell., is in the wooded regions of the north temperate zone, between the isotherms of 0 and 10°C. [32 and 50°F.], where it is closely associated with its chief food-plant, the mountain ash (*Sorbus aucuparia*). The adult of this Tineid is described, and an account is given of its bionomics as observed in Sweden by Ahlberg [*R.A.E.*, A **16** 235; *cf.* also **14** 111; **22** 514]. In Switzerland, where it thrives at high altitudes, the life-cycle appears to resemble that in Sweden. In 1935, berries of the mountain ash were plentiful and 40–60 per cent. were attacked. Nevertheless, apples also were severely, though not uniformly, infested [**25** 211] in the same regions as in 1933, when the Tineid was first noticed as of economic importance in Switzerland [**24** 76]. Some varieties of apple are more susceptible than others. Spraying with nicotine as suggested by Ahlberg [**16** 236] is recommended for control.

Faes (H.). **Station fédérale d'essais viticoles à Lausanne et Domaine de Pully. Rapport annuel 1936.**—*Landw. Jb. Schweiz* **51** pt. 10 pp. 1045–1079, 6 figs., 2 graphs. Berne, 1937.

The pests of vine dealt with in this report include *Phylloxera* and the vine moths [*Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff.]. *P. botrana* is increasing considerably in numbers. Sprays of summer oil gave well over 80 per cent. mortality of the eggs of both generations. *Cydia* (*Carpocapsa*) *pomonella*, L., had only one generation on apple in 1936, except for a few individuals of a second generation in central Valais. Lead arsenate sprays gave better control than other insecticides. In the Domaine de Pully, cherries were severely attacked by *Rhagoletis cerasi*, L., although the soil had been treated with 5 per cent. tar distillate.

WIESMANN (R.). **Die Orientierung der Kirschfliege,** *Rhagoletis cerasi* **L., bei der Eiablage. (Eine sinnesphysiologische Untersuchung.)** [The Orientation of the Cherry Fly, *R. cerasi*, when ovipositing. (An Investigation on Sense Physiology.)]—*Landw. Jb. Schweiz* **51** pt. 10 pp. 1080–1109, 7 figs., 18 refs. Berne, 1937. (With a Summary in French.)

The following is taken from the author's summary of this detailed account of experiments on the stimuli influencing the ovipositing females of *Rhagoletis cerasi*, L. : The fly finds food on the leaves of cherry trees by chemotactic sensitivity in the tarsi. By suppression of the sense of vision or of the sense of smell (localised in the antennae), it was proved that the fly finds the fruit solely by sight. The reactions of the females to 17 different varieties of fruit were observed, and it was found that they approached all and oviposited in many of them, but fruits that were too hard or had a hairy or irregular surface were not attacked. The number of eggs laid depended on the consistency of the pulp, but the larvae developed only in cherries and *Lonicera*. Chemotaxis does not cause actual oviposition, for females tried to deposit eggs in fruits coated with paraffin and therefore quite tasteless. The reflex inducing oviposition is stimulated by the smooth surface. Even artificial fruits coated with paraffin were attacked. The females were able to distinguish differences of size and shape ; balls of plastic material 4–24 mm. in diameter appeared favourable for oviposition, but larger ones were not attacked. This was confirmed with real fruits of various sizes.

SZYMAŃSKI (W.). **Uzupełnienie do pracy pod tytułem : Skład chemiczny i własności karbolineów sadowniczych stosowanych w Polsce.** [Supplement to the Work entitled : Chemical Composition and Properties of Polish Fruit-tree Carbolineums.] [*In Polish.*]—*Roczn. Ochr. Rosl.* **4** fasc. 4, Suppl. 6 pp., 9 pls., 1 ref. Warsaw, 1937.

This paper, which supplements one already noticed [*R.A.E.*, A **26** 97], contains plates illustrating the different types of stains produced on blotting paper by drops of various tar-distillate emulsions in the course of tests to determine whether the fluids are of uniform consistency or tend to form layers. The drops were taken from the upper, middle and bottom strata of the fluids, which were kept in glass or metal containers. Other plates show the effect of 4 types of tar distillates on the development of apple twigs, and three are graphs illustrating the process of distillation of various Polish tar-distillates at temperatures varying from 100 to 370°C.

UHLMANN (E.). **Unsere Material- und Vorratsschädlinge in ihrer Beziehung zum Freilandleben.** [Pests of Timber, Fabrics and stored Foodstuffs in Germany and their Relation to Life in the Open.]—*Mitt. Ges. Vorratschutz* **13** no. 5 pp. 57–60; **14** no. 1 pp. 3–10. Berlin, 1937–38.

The author discusses the degree to which various insects that are pests of timber, fabrics, stored foodstuffs, etc., in Germany, have adapted themselves from life in the open and points out that some, such as Siricids in timber and indigenous Bruchids, are carried indoors with infested material and do not reproduce there. Few of the pests are confined to existence in stores, but nothing is known of the relation of certain species, such as the cacao moth (*Ephestia elutella*, Hb.) to existence in the field. It would be expected that insects introduced from warmer countries would not survive in the open in Germany, but the tropical American bean beetle, *Bruchus* (*Bruchidius*) *obtectus*, Say, which has been limited to indoor life in that country, has been found in the field near Vienna.

ZACHER (F.) & FOERSTER (H.). **Der Mulmbock,** *Ergates faber* **L., als Nutzholzschädling.** [*E. faber* as a Pest of worked Timber.]—*Mitt. Ges. Vorratsschutz* **14** no. 1 pp. 2–3, 1 fig. Berlin, January 1938.

The Prionid, *Ergates faber*, L., which is one of the largest Longicorns in Germany, is not an important forest pest, but the larvae cause very serious injury to worked timber. The egg is described in some detail. The egg stage lasted 3½ weeks at 18–20°C. [64·4–68°F.], and the larval stage is said to last up to 12 years. Felled timber is usually infested with the eggs before removal from the forest, adult flight occurring from mid-June to September.

PUSSARD (R.). **Nouvelle contribution a l'étude de la teigne de la lavande.**—*C. R. Acad. Agric. Fr.* **24** no. 3 pp. 103–112, 2 refs. Paris, 1938.

In further experiments [*cf. R.A.E.*, A **25** 485] on the control of *Sophronia humerella*, Schiff., on lavender in the Basses-Alpes, single applications of sprays were made in February or April 1937. Of those tested in February, the best results were given by the nicotine sulphate spray previously recommended [*loc. cit.*] and by anthracene oil at a concentration of 10 per cent. in Bordeaux mixture (2 : 3 : 100). Plots of lavender treated with these sprays gave yields of 2,318 and 1,485 lb. flowers per acre, respectively, while the control plots gave about 90 lb. Anthracene oil was less effective when used at a concentration of 6 per cent. or when emulsified with water instead of Bordeaux mixture. It apparently stimulated the plants, except in emulsion with water, when it caused some severe scorching, possibly owing to the emulsifying agent employed. Of the treatments applied in April, the nicotine sulphate spray again gave much the best results (1,683 lb. flowers per acre). The other nicotine salts tested gave very poor results, with the exception of nicotine laurate (3 : 2,000) which gave a yield of 648 lb. flowers per acre when used alone and 837 lb. when mixed with calcium arsenate ; calcium arsenate alone gave 216 lb. Each clump of lavender should be well wetted with the spray ; the value of the increased crop more than compensates for the expense of spraying.

[ARKHANGEL'SKAYA (A. D.).] **Архангельская (А. Д.). The Coccidae of Middle Asia.** [*In Russian.*]—Roy. 8vo, 159 pp., 92 figs., 64 refs. Tashkent, Izd. Kom. Nauk UzSSR, 1937. Price 6 *rub.* [Recd. March 1938.] (With a Summary in English.)

The main part of this work consists of keys to some 70 species of Coccids that attack plants of more or less economic importance in

Central Asia, together with descriptions of the different stages of each, and notes on its distribution, biology and food-plants. Other sections include a discussion of the economic importance of the chief Coccids, an annotated list of some 55 additional species that are not of economic importance, and lists of the cultivated and wild food-plants, showing the Coccids that attack them. Five new species and one new variety are described.

[Bilanovs'kiĭ (I. D.).] **Білановський (І. Д.). Zoologische Faktoren, welche während 1934–1936 die Vermehrung der Apfelbaumgespinstmotte im Kiewer Gebiet beschränkten.** [Zoological Factors that limited the Increase of the Apple Moth in the Province of Kiev in the Years 1934–1936.] [*In Ukrainian.*]—*Trav. Mus. zool. Acad. Sci. Ukr.* no. 21–22 pp. 153–166, 7 refs. Kiev, 1938. (With Summaries in Russian and German.)

Hyponomeuta padellus malinellus, Zell., was abundant on apple throughout the Ukraine in 1934, but, as a result of the activity of parasites in that year, it was of no importance in 1935, though it again increased in numbers in 1936. Investigations on its parasites were carried out near Kiev in 1934 and 1936. Of 350 larvae and pupae taken in nests in 1934, 51·3 per cent. gave rise to adult moths, 16·2 per cent. died from unknown causes, 15·9 per cent. were destroyed by the Sarcophagid, *Agria mamillata*, Pand. [*cf. R.A.E.*, A **25** 6], 8 per cent. by the Ichneumonid, *Angitia armillata*, Grav., and 8·6 per cent. by other parasites. In 1936, the nests under observation contained a total of 513 larvae, of which 40·3 per cent. gave rise to adult moths, while 18·2 per cent. were killed in the larval or pupal stage by diseases, and 41·5 per cent. were destroyed by parasites. Of these, 56·8 per cent. were attacked by *Agria mamillata*, 16·4 per cent. by *Angitia armillata* and 13·2 per cent. by the Tachinid, *Discochaeta yponomeutae*, Rond. The larvae of *Agria* destroy 5 or 6 host larvae and pupae each ; at the end of June they drop from the nests of *Hyponomeuta* and enter the upper layer of the soil, where they pupate and hibernate. When nests of the moth containing larvae in the third instar were covered with muslin, the percentage of parasitism by *A. mamillata* was not altered, whereas that by Hymenopterous parasites was decreased, which shows that the latter attack the older larvae and the pupae, and *Agria* the young larvae. This Sarcophagid, which requires humidity for its development, was more abundant in orchards that were situated in damp places, whereas Hymenopterous parasites were found in dry localities exposed to the sun.

[Bilanovs'kiĭ (I. D.] **Білановський (І. Д.). Ueber die wirtschaftliche Bedeutung einiger parasitischen Insekten.** [Notes on the economic Importance of some parasitic Insects.] [*In Ukrainian.*]—*Trav. Mus. zool. Acad. Sci. Ukr.* no. 21–22 pp. 167–169. Kiev, 1938. (With Summaries in Russian and German.)

Of parasites bred from a batch of 125 parasitised examples of the cabbage aphis, *Brevicoryne brassicae*, L., collected in July–August 1936 in six different vegetable fields in the environs of Kiev, the Cynipid, *Charips minuta*, Htg., was obtained from 52·8 per cent., the Braconid, *Aphidius brassicae*, Marsh., from 25·6 per cent., the Pteromalids, *Pachyneuron aphidis*, Bch., from 11·2 per cent., and *Asaphes* (*Isocratus*) *vulgaris*, Wlk., from 4·8 per cent., and the Eulophid, *Tetrastichus* (*Geniocerus*) *rapo*, Wlk., from 2·4 per cent. The fact that *C. minuta*, *A. vulgaris* and *T. rapo* are hyperparasites, together destroying 60 per cent. of the primary parasites of the Aphid, explains the comparatively low rate of parasitism of the latter in the environs of Kiev in 1936. The actual host or hosts of these hyperparasites were not ascertained.

[RODENDORF (B.).] **Родендорф (Б.). Beiträge zur Kenntnis der Tachinen des Wiesenzünslers** (*Loxostege sticticalis* **L.**). [Contributions to the Knowledge of the Tachinid Parasites of *L. sticticalis*.] [*In Russian*.]—*Bull. Acad. Sci. URSS* 1935 (7) no. 5 pp. 753–780, 21 figs., 9 refs. Moscow, 1935. (With a Summary in German.) [Recd. March 1938.]

A key is given to the adults of the eight species of Tachinids that have been bred from larvae or pupae of *Loxostege sticticalis*, L., in the Russian Union. Of these, the most important are *Tachina* (*Larvaevora*) *civilis*, Rond., and *Zenillia* (*Clemelis*) *pullata*, Mg., all stages and the male and female genitalia of which are described in detail.

Laboratory observations in 1930 showed that females of *T. civilis* oviposited on moving larvae of *L. sticticalis*, but not on those that were motionless. The maximum number of eggs deposited by a female was 143, but dissection of the ovaries showed that the potential fecundity ranged up to 240 eggs. Hibernation took place in the first larval instar in the body of the host. In 1930, two summer generations were produced in the laboratory, the adults of which occurred in the second half of July and the second half of August, respectively. Very few of the latter oviposited. The preoviposition period was about 3 days. The egg stage lasted 3–6 days, and the larval and pupal stages averaged 14·77 and 23·34 days, respectively, in the first generation, and did not differ materially in the second. Young larvae diapaused with their hosts. Females of *T. civilis* also oviposited in the laboratory on larvae of *Pyrausta nubilalis*, Hb., *Polia* (*Mamestra*) *pisi*, L., *P. oleracea*, L., and *Agrotis occulta*, L.

Females of *Z. pullata* oviposited on the food-plants of *L. sticticalis*, the larvae of which swallowed the eggs when feeding. The eggs of the Tachinid were still viable after a month. Larval development, which lasted a minimum of 18 days, takes place in the body cavity of the host, which continues feeding and ultimately pupates, except when it has ingested too many eggs of the Tachinid, in which case both host and parasites die.

PAPERS NOTICED BY TITLE ONLY.

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BRITTIN (G.). **Notes on the Genus** *Leucaspis* [*Leucodiaspis*], **with Descriptions of thirteen New Zealand Species** [including 7 new ones] **and Re-description of eight foreign Species.**—*Trans. roy. Soc. N.Z.* **67** pt. 3 pp. 281–302, 2 pls., 12 refs. Wellington, N.Z., December 1937.

[Borkhsenius (N. S.).] **Борхсениус (Н. С.). Tables for the Identification of Coccids (Coccidae) injurious to cultivated Plants and Forests in the USSR.** [*In Russian.*]—Demy 8vo, 148 pp., 186 figs., 33 refs. Leningrad, Leningr.obl.karant.Insp., 1937.

Takizawa (M.). **A List of** [177] **Insects injurious to Agricultural and Horticultural Plants in Manchukuo.** [*In Japanese.*]—*S. Manchuria Rly agric. Exp. Sta. Bull.* no. 40 pp. 1–68. Yugakujo, Manchuria, 1937.

Wu (Chen-chung). **Study of Control Measures against Cotton Aphid** [*Aphis gossypii*, Glov., in China].—*J. econ. Ent.* **30** no. 6 pp. 898–900. Menasha, Wis., December 1937. [*Cf. R.A.E.*, A **26** 245.]

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CONTENTS.

PAGE
Africa: Entomological Problems in the Italian Colonies ... 260
Africa, North: Insect Pests in Tripolitania ... 260
America, North: The Sawflies of the Genus *Pikonema* ... 293
America, South: *Epicauta* spp. attacking Potato ... 290
Argentina: The Green Aphids of Cereals and their Natural Enemies 289, 290
Australia: Regulations for Fruit-fly Control in New South Wales ... 267
Australia: An Epizootic in *Lepidiota caudata* in Queensland ... 267
Australia: Dusts against *Monolepta rosea* on Citrus ... 268
Austria: Starlings destroying *Tanymecus palliatus* ... 255
Brazil: A new Species of *Dysdercus* ... 268
British Isles: Reports on miscellaneous Pests in 1937 ... 296
British Isles: Laboratory Methods for testing Ovicides ... 297
British Isles: Sprays against *Paratetranychus pilosus* on Damsons ... 297
British Isles: The Control of *Hylemyia antiqua* on Onion ... 298
British Isles: *Borkhausenia pseudospretella* attacking Lepidopterous Pupae ... 298
Burma: A Dynastid injurious to Sugar-cane ... 294
Canada: New Records of Moths from Vancouver Island ... 293
Canada: The Occurrence of *Sitona lineata* ... 293
China: Measures against *Aphis gossypii* on Cotton (*Title only*) ... 304
Cyprus: The Insect Pests of Apple ... 259
Czechoslovakia: A Treatment for Arsenic Poisoning in Bees ... 255
Formosa: The Food Habits of Coccids ... 262
Formosa: The Insect Pests of Banana ... 263
Formosa: Varietal Susceptibility of Sugar-cane to Insect Pests ... 263
Formosa: Studies on *Dacus dorsalis* ... 263
France: Tests of Summer Sprays against *Cydia pomonella* ... 259
France: Sprays against *Sephronia humerella* on Lavender ... 301
France: Studies on Coccids (*Title only*) ... 303
Germany: *Plesiocoris rugicollis* attacking Apple ... 250
Germany: Methods of protecting Fields from Oviposition by *Melolontha* 250
Germany: Growth Physiology affecting Resistance of Oats to *Oscinella frit* ... 251
Germany: Factors affecting Susceptibility of Plants to *Lecanium corni* 251
Germany: An Electrocuting Light-trap for *Melolontha* ... 251
Germany: Suspension Power and Solubility of Calcium Arsenates ... 252
Germany: The Injury done to Silver Fir by Aphids ... 252
Germany: Investigations on Adult Longevity of *Melolontha* spp. ... 253
Germany: The Relation of Store Pests to Life in the Open ... 300
Germany: *Ergates faber* as a Pest of Timber ... 301
Holland: Insect Pests and their Control in 1936 ... 299
Hungary: Sprays against *Cydia pomonella* on Apple ... 254
India: Pests of Sugar-cane in Bombay ... 261
India: Varietal Resistance of Cotton to Jassids ... 261
Japan: A Cecidomyiid on Soy Beans ... 264
Japan: A Mosaic of Leguminous Plants transmitted by *Myzus persicae* 265
Japan: A Note on *Agrilus spinipennis* ... 265
Japan: Hesperiid Larvae on Rice ... 265
Japan: Insecticides effective against *Epicauta gorhami* ... 265
Japan: *Cocytodes caerulea* on Ramie ... 266
Japan: New Ichneumonids parasitic on Pine Sawflies ... 295
Japan: New Species of Aphelinids ... 296
Korea: An Outbreak of *Malacosoma neustria testacea* ... 264
Korea: Artificial Rearing of the Sumach Gall Aphids ... 264
Latvia: Observations on *Apion seniculum* and *Phaedon cochleariae* ... 256
Loochoo Islands: Infestation of Sugar-cane by *Sesamia inferens* ... 264
Malaya: Biological Notes on Scolytoidea ... 295
Manchuria: Records of Braconids, including a new Species ... 296
Manchuria: A List of Insect Pests (*Title only*) ... 304
Mexico: Parasites of *Platyedra gossypiella* ... 274
Netherlands Indies: A Cerambycid attacking *Albizzia* in Java ... 261
Netherlands Indies: A new Lamiid injurious to Orchids ... 262
Netherlands Indies: Ants damaging Electric Wiring, etc. ... 262
Netherlands Indies: Cerambycids infesting Clove Trees ... 295
New Zealand: Insects boring in Fruit Trees ... 266
New Zealand: The Coccids of the Genus *Leucodiaspis* (*Title only*) ... 303
Persia: The Bionomics of *Platyedra vilella* ... 249
Poland: Halticids and their Food-plants near Vilno ... 255
Poland: Outbreaks of *Operophtera brumata* on Oaks ... 256

CONTENTS—*cont.*

PAGE
POLAND : *Cleonus punctiventris* on Beet 256
POLAND : The Composition and Properties of Tar Distillates 300
RUSSIA : Anabiosis and Resistance to Cold in *Pyrausta nubilalis* 257
RUSSIA : A Species of *Tetranychus* on Soy Beans in Ukraine 257
RUSSIA : A Weevil infesting *Camelina sativa* in Ukraine 257
RUSSIA : Parasites of *Hyponomeuta* on Apple in Ukraine 302
RUSSIA : Parasites and Hyperparasites of *Brevicoryne brassicae* 302
RUSSIA, ASIATIC : Species of *Platyedra* in Uzbekistan 249
RUSSIA, ASIATIC : Tests of Essential Oils against Pests in Uzbekistan ... 249
RUSSIA, ASIATIC : The Coccids of Central Asia 301
RUSSIA UNION : Tachinid Parasites of *Loxostege sticticalis* 303
RUSSIA UNION : Keys to Coccids attacking cultivated Plants (*Title only*) 304
SWITZERLAND : *Argyresthia conjugella* on Mountain Ash and Apple ... 299
SWITZERLAND : Vine and Orchard Pests in 1936 299
SWITZERLAND : Stimuli affecting ovipositing Females of *Rhagoletis cerasi* 300
U.S.A. : Insect Pests of Cucurbits in Missouri 269
U.S.A. : Work on Insect Pests in New York in 1936–37 269
U.S.A. : Resistance of Varieties of Apple to *Empoasca fabae* 271
U.S.A. : Paradichlorobenzene in Sprays against *Aegeria exitiosa* 271
U.S.A. : Dormant Sprays for Virginia Orchards 272
U.S.A. : *Bregmatothrips iridis* and its Control on Iris 273
U.S.A. : Work on Cotton Pests and on their Control 274, 275–279
U.S.A. : *Celama sorghiella* on *Sorghum* in Texas 279
U.S.A. : The Control of *Scutigerella immaculata* in California 280
U.S.A. : The Physiology of Psyllid Yellows of Potatoes 281
U.S.A. : A Noctuid attacking Gooseberry in Colorado 281
U.S.A. : The Problem of Range Grasshoppers 282
U.S.A. : Tolerance of Sheep to Pyrethrum Extracts 282
U.S.A. : Winter Mortality of *Blissus leucopterus* in Iowa 283
U.S.A. : A Method of estimating Populations of *Paratetranychus citri* ... 283
U.S.A. : Long-distance Migrations of *Eutettix tenellus* 283
U.S.A. : A new wetting and spreading Agent for Insecticides 285
U.S.A. : A Termite infesting Turnips in Florida 285
U.S.A. : *Desmia funeralis* and its Parasites in California 285
U.S.A. : Sodium Lauryl Sulphate as a Contact Spray 286
U.S.A. : Overwintering of Adults of *Cylas formicarius* in Louisiana ... 286
U.S.A. : *Tyrophagus putrescentiae* on cultivated Mushrooms 286
U.S.A. : Observations on *Nodonota puncticollis* 287
U.S.A. : Homoptera associated with *Narcissus* 288
U.S.A. : Insect Pests and their Control in Oregon in 1934–36 291
U.S.A. : Oviposition and Sex Ratio in *Hyposoter pilosulus* 291
U.S.A. : An interesting Food Habit of False Wireworm Adults 292
U.S.A. : Nests of leaf-cutting Bees in Figs in California 292
U.S.A. : New Species of Aphids (*Title only*) 304
U.S.A. : A Key to *Lachnosterna* Larvae in Kentucky (*Title only*) 304
U.S.A. : Oviposition by *Heliothis armigera* on Maize (*Title only*) 304
U.S.A. : Patents relating to Pest Control (*Title only*) 304
WEST INDIES : Insect Pests in the Cayman Islands 268
WEST INDIES : New Jassids from Porto Rico 288
WEST INDIES : An Ant destroying Eggs of *Diatraea saccharalis* 288
The Action of Dusts that kill Insects by Desiccation 252
An Apparatus for testing Contact Dust Insecticides 253
The Evaluation of Plants containing Rotenone 258
Effects of Spreaders and Emulsifiers on Deposit of Oil Sprays 280
Physical Properties of commercial Paris Greens 282
Toxicity of High Temperatures to Eggs of *Bruchus obtectus* 284
Homologues of Paris Green prepared from Animal and Vegetable Oils ... 284
Starvation of developing Parasites as an Explanation of Immunity ... 287
A new Bruchid from Seeds of *Erythrina* 292
The Biology of *Syntomaspis eurytomae* (*Title only*) 304
Pests and Diseases of Mushrooms (*Title only*) 304
The Rôle of Water in Insect Hibernation (*Title only*) 304
Effects of Hypertonic Solutions and Cyanide on Development and Respiration of Eggs of *Melanoplus differentialis* (*Titles only*) ... 304
LEGISLATION : Regulations for Fruit-fly Control in New South Wales ... 267

Printed under the authority of HIS MAJESTY'S STATIONERY OFFICE
by the South Essex Recorders, Ltd., High Road, Ilford.

(821) Wt. P2/3656 1700 5/38 S.E.R. Ltd. Gp. 353.